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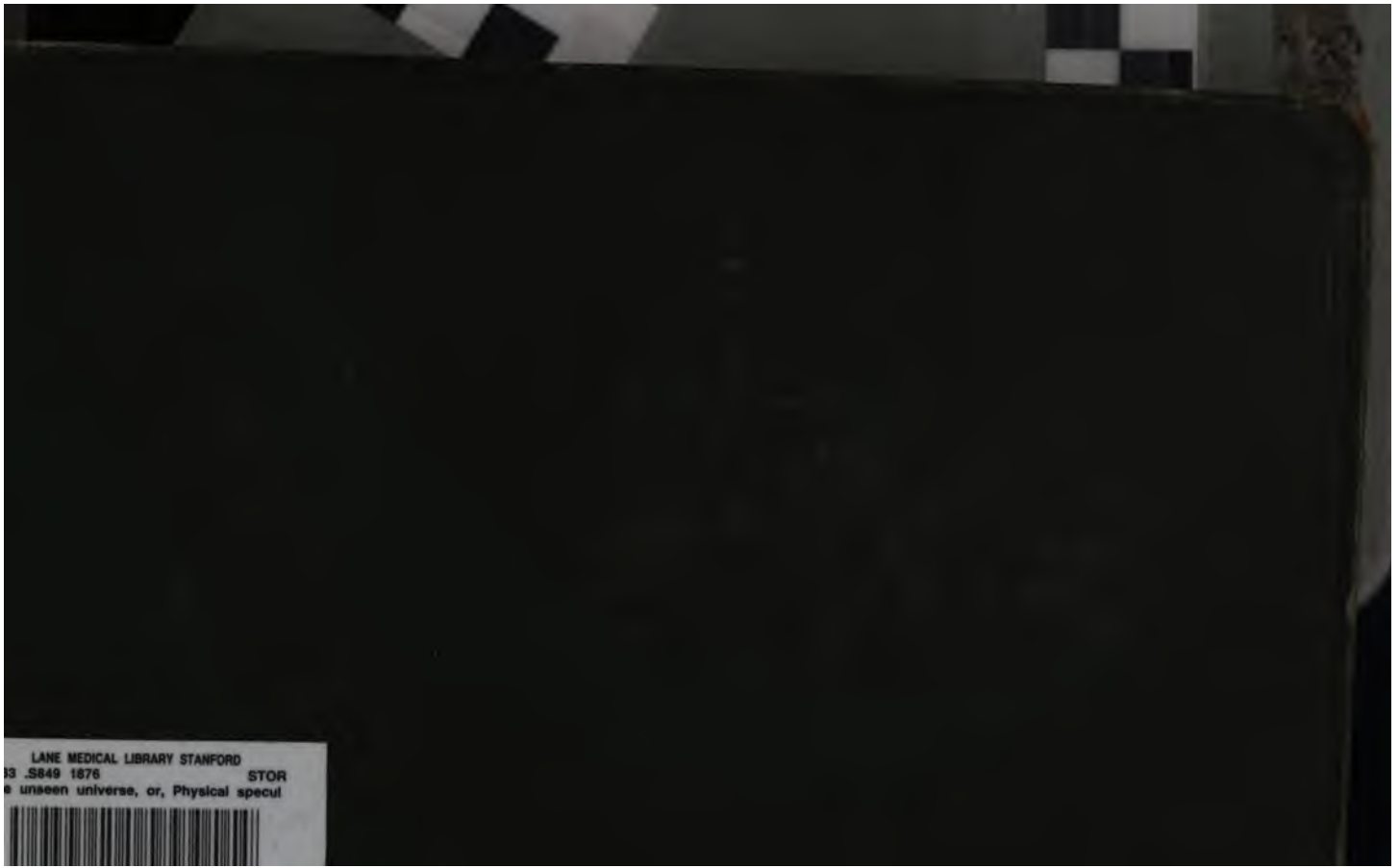
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God is.
There is infinity of littleness of greatness of form. space

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All φυσις is in a state of change
All matter is the expression of spirit.

a connection between the unseen and unseen universe is possible at all times.
All nature reflects God.
∴ Principles of nature lead to knowledge of God

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THE UNSEEN UNIVERSE

E. W. Sawyer

Nov 1 1945

Blessed Lord, who hast caused all holy Scriptures to be written for our learning; Grant that we may in such wise hear them, read, mark, learn, and inwardly digest them, that by patience, and comfort of thy holy Word, we may embrace, and ever hold fast *the blessed hope of everlasting life*, which thou hast given us in our Saviour Jesus Christ.—*Amen.*

Edinburgh University Press:
T. AND A. CONSTABLE, PRINTERS TO HER MAJESTY.

5849
1876

PREFACE.

OUR readers will find near the end of our work the following paragraph, which has appeared in every edition :—'We are in hopes that when this region of thought comes to be further examined, it may lead to some common ground on which followers of science on the one hand, and of revealed religion on the other, may meet together and recognise each other's claims without any sacrifice of the spirit of independence, or any diminution of self-respect. Entertaining these views, we shall welcome with sincere pleasure any remarks or criticism on these speculations of ours, whether by the leaders of scientific thought, or by those of religious inquiry.'

A work like ours, containing a challenge of this sort, has naturally called forth a great amount of criticism. Bearing in mind the existence of the '*odium theologicum*,' we are bound to confess that at first we were disposed to tremble on opening any review of our work in a theological journal of repute. We were soon however delightfully perplexed at finding that the leaders of religious inquiry were disposed to treat us with the utmost courtesy, agreeing with us in very many points, and stating when necessary any difference of opinion in a manner calculated alike to preserve thei independence and to conciliate our self-respect We feel much gratified and encouraged by thi treatment, and we think that if our fourth ed tion be compared with our first, it will be fou that we possess some plasticity and have learn to make some use of the criticism so faithf and courteously bestowed upon us.

Here we would wish to take an oppor of stating that the Principle of Contin

upheld by us has reference solely to the intellectual faculties. We are led, for instance, by this principle to assert that the process of production of the visible universe must have been of such a nature as to be comprehensible more or less to the higher intelligences of the universe.

But we are not led to assert the eternity of stuff or matter, for that would denote an unauthorised application to the invisible universe of the experimental law of the conservation of matter which belongs entirely to the present system of things.

Nor are we led to assert that the ether must play some important part in our future bodies, for our knowledge of things is vastly too limited to enable us to come to any such conclusion.

Notwithstanding these remarks, if any theologian of repute thinks that our fourth and subsequent editions savour too much of ideas of this nature, we will gladly amend our language when a suitable opportunity occurs. It

is probably due to misconception of our words, possibly to a difficulty, which we have all along felt, of finding words exactly fitted to express some of the more novel of the conceptions to which we have been led, that we have been spoken of, to a certain extent even by some friendly critics, as 'subtly materialistic' or as 'loose Positivists.' Unless we were to coin new terms (which we may yet find it necessary to do), it will probably be found all but impossible to escape such charges when writing on such matters.

While the treatment we have experienced from the true leaders of religious thought has been all that we could wish, and while some of them have come forward as our champions rather than our critics, we regret to think that certain of their following have not invariably imitated the good example thus set them. All are not Bayards, whether we regard the temper of the blade or that of the individual who wields it.

Pages of so-called 'extracts' from our book have been strung together, now by some writers of the High Church school, anon by writers of the very lowest Evangelical type, in each case with absolute disregard of their original collocation and surroundings, and the result is of course as utterly unfair a representation of our meaning as could possibly be given. These 'extracts,' which are always scrupulously enclosed in inverted commas, are not merely altered in meaning by being arbitrarily detached from the context—they are often altered by the insertion of terms (*e.g. luminiferous force!*) which we, as scientific men, could not possibly have employed.

People who adopt a system like this deserve to have, once for all, thoroughly brought home to them the bitter rebuke administered to their analogues long ago by a witty if semi-profane divine, who proposed to choose his text on their principle, and gave out, to the astonishment of his audience, *part* only of a verse, viz., 'Hang all the law and the prophets'!

We have placed at the commencement of this Preface the only words of ours which appear to commit us to controversy, and we trust that a study of them will convince our readers, as it has convinced us, that we do not stand committed to the hopeless task of entering the lists against *this species of controversialist.*

It is with reluctance that we have felt ourselves compelled to allude to a method of controversy, in our opinion, as deficient in Christian courtesy as it is powerful to stifle the interests of truth.

October 1876.

PREFACE TO THE FIRST EDITION.

FORGETFUL of the splendid example shown by intellectual giants like Newton and Faraday, and aghast at the materialistic statements now-a-days freely made (often professedly in the name of science), the orthodox in religion are in somewhat evil case.

As a natural consequence of their too hastily reached conclusion, that modern science is incompatible with Christian doctrine, not a few of them have raised an outcry against science itself. This result is doubly to be deplored; for there cannot be a doubt that it is calculated to do mischief, not merely to science but to religion.

Our object, in the present work, is to endeavour to show that the presumed incompatibility of Science and Religion does not exist. This, indeed, ought to be self-evident to all who believe that the Creator of the Universe is Himself the Author of Revelation. But it is strangely impressive to note how very little often suffices to alarm even the firmest of human faith.

Of course we cannot, in this small volume, enter

upon the whole of so vast a subject, and we have therefore contented ourselves with a brief, though, we hope, sufficiently developed discussion of one very important—even fundamental—point. We endeavour to show, in fact, that immortality is strictly in accordance with the principle of Continuity (rightly viewed); that principle which has been the guide of all modern scientific advance. As one result of this inquiry we are led, by strict reasoning on purely scientific grounds, to the probable conclusion that 'a life *for* the unseen, *through* the unseen, is to be regarded as the only perfect life.' (See Chap. VII.) We need not point out here the bearing of this on religion. Incidentally, the reader will find many remarks and trains of reasoning which (by the alteration of a word or two) can be made to apply to other points of almost equal importance.

We may state that the ideas here developed—very imperfectly of course, as must always be the case in matters of the kind—are not the result of hasty guessing, but have been pressed on us by the reflections and discussions of several years.

We have to thank many of our friends, theological as well as scientific, for ready and valuable assistance. The matter of our work has certainly gained by this, though it is likely that the manner may have suffered by the introduction, here and there, of peculiarities of style which could not easily be removed without damage to the sense.

Two months after first edition

PREFACE TO THE SECOND EDITION.

As a preface to our Second Edition, we cannot do better than record the experience derived from our first. It is indeed gratifying to find a wonderful want of unanimity among the critics who assail us, and it is probably owing to this cause that we have been able to preserve a kind of kinetic stability, just as a man does in consequence of being equally belaboured on all sides by the myriad petty impacts of little particles of air.

Some call us infidels, while others represent us as very much too orthodoxly credulous; some call us pantheists, some materialists, others spiritualists. As we cannot belong at once to *all* these varied categories, the presumption is that we belong to none of them. This, by the way, is our own opinion.

Venturing to classify our critics, we would divide them into three groups:—

(1.) There are those who have doubtless faith in revelation; but more especially, sometimes solely, in *their own* method of interpreting it; none, however, in the method according to which really scientific men with a won-

derful unanimity have been led to interpret the works of nature. These critics call us, some infidels, some pantheists, some dangerously subtle materialists, etc.

(2.) There are those who have faith in the methods according to which men of science interpret the laws of nature, but none whatever in revelation or theology. These consider us as orthodoxly credulous and superstitious, or as writers of 'the most hardened and impenitent nonsense that ever called itself original speculation.'

(3.) There are those who have a profound belief that the true principles of science will be found in accordance with revelation, and who welcome any work whose object is to endeavour to reconcile these two fields of thought. Such men believe that the Author of revelation is likewise the Author of nature, and that these works of His will ultimately be found to be in perfect accord. Such of this school as have yet spoken have approved of our work.

Our readers may judge for themselves which of these three classes of belief represents most nearly the true Catholic Faith.

Many of our critics seem to fancy that we presume to attempt such an absurdity as a demonstration of Christian truth from a mere physical basis! We

simply confute those who (in the outraged name of science) have asserted that science is incompatible with religion. Surely it is not *we* who are dogmatists, but those who assert that the principles and well-ascertained conclusions of science are antagonistic to Christianity and immortality. If in the course of our discussion we are to some extent constructors, and find analogies in nature which seem to us to throw light upon the doctrines of Christianity, yet in the main our object is rather to break down unfounded objections than to construct apologetic arguments. These we leave to the Theologian. The Bishop of Manchester has very clearly described our position by stating that [*from a purely physical point of view*, § 204] we 'contend for the possibility of immortality and of a personal God.'

To vary the metaphor, we have merely stripped off the hideous mask with which materialism has covered the face of nature to find underneath (what every one with faith in anything at all must expect to find) something of surpassing beauty, but yet of inscrutable depth. For indeed we are entire believers in the infinite depth of nature, and hold that just as we must imagine space and duration to be infinite, so must we imagine the structural complexity of the universe to be infinite also. To our minds it appears no less false to pronounce eternal *that aggregation we call the atom*, than it would be to pronounce eternal *that aggregation we call the Sun*. All this follows

from the principle of Continuity, in virtue of which we make scientific progress in the knowledge of things, and which leads us, whatever state of things we contemplate, to look for its antecedent in some previous state of things also in the Universe. This principle represents the path from the known to the unknown, or to speak more precisely, our conviction that there is a path. Nevertheless it does not authorise us to dogmatise regarding the properties of the unknown lying beyond or at the boundary of our little 'clearing.' We must go up to it and examine it often, with long continued labour, under great difficulties, before we can at all say what its properties are.

Among those who recognise us as orthodox, and for that reason attack us, there is one of deservedly high authority. Our 'brother,' Professor W. K. Clifford, has published a lively attack on our speculations in a recent number of the *Fortnightly Review*. We are bound respectfully to consider the arguments of an adversary of his calibre.

He appears to be unable to conceive the possibility of a spiritual body which shall not die with the natural body. Or rather, he conceives that he is in a position to assert, from his knowledge of the universe, that such a thing cannot be. We join issue with him at once, for the depth of our ignorance with regard to the unseen universe forbids us to come to any such conclusion with regard to a possible spiritual body.

Our critic begins his article by summoning up or

constructing a most grotesque and ludicrous figure, which he calls *our argument*, and forthwith proceeds to demolish ; and he ends by summoning up a horrible and awful phantom, against which he feelingly warns us. This phantom has already, it seems, destroyed two civilisations, and is capable of even worse things, though it is merely the 'sifted sediment of a residuum.' He does not tell us whether he means Religion in general, or only that particularly objectionable form of it called Christianity.

Our critic shows that he has not read our work,—has, in fact, merely glanced into it here and there. This is proved by what he says of Struve's notions, on which we lay no stress whatever, while he puts them forward as the mainstay of our argument. We are also made out to be the assertors of a peculiar molecular constitution of the unseen universe, although with reference to this we say in our work, page 217, '*for the sake of bringing our ideas in a concrete form before the reader, and for this purpose only*, we will now adopt a definite hypothesis.' Of course it is too much to expect a critic now-a-days to read every word of a book which he is content to demolish, *but we did hope he might have noticed the italics.*

Our critic too commits several singular mistakes due to imperfections of memory. Why speak of the negative as universal, which appears in such words as *im*mortality, end*less* existence, etc., when the most common of all expressions connected with the subject

are the phrases, '*eternal* life,' '*everlasting* life,' etc., none of which involve the negative?

How the sun could go down upon 'Gideon' is not obvious. Had it done so it would certainly have occasioned personal inconvenience (to say the least) to that hero. But what's in a name? Our critic was evidently thinking of Joshua and 'Gibeon,' and why should a critic care about the difference between Amorites and Amalekites? It is a mere matter of spelling,—a trifle. Similar mistakes in a previous article are apologised for in a footnote appended to that on the 'Unseen Universe.' Probably the author designed the apology to extend to it also, but forgot to say so; again a trifle. But it is of straws, some even weaker than these, that the imposing article is built; so that when we come forth to battle we find nothing to reply to.

To reduce matters to order, we may confidently assert that the only reasonable and defensible alternative to our hypothesis (or, at least, something similar to it) is, the stupendous pair of assumptions that visible matter is *eternal*, and that IT IS ALIVE. (See § 240.) If any one can be found to uphold notions like these (from a scientific point of view), we shall be most happy to enter the lists with him.

We have made numerous small though sometimes important changes in the text, but none of them at all modify the general tenor of the work as it first appeared two months ago.

PREFACE TO THE THIRD EDITION.

WE have reason to think that notwithstanding all we have said, the position we take is not yet clearly understood, and we would therefore utilise the Preface to our Third Edition to put ourselves right with the public on this vital point.

To begin with the scientific side of our argument, we must once more make the statement that it is not we who are the dogmatists, but rather that school of scientific men who assert the incompatibility of science with Christianity.

Persistent as they have been in their endeavours to close the door leading from the seen to the unseen, we as resolutely maintain that it must be left open.

This class take credit to themselves for having thus barred the entrance to a throng of superstitious fancies which would inevitably rush through an open avenue—forgetting that they have by the same act barred the way to all the higher aspirations of man.

But though we have founded no argument for im-

mortality on the existence of these higher aspirations, we cannot allow our adversaries to bar the way upon the plea that it would inevitably be the resort of unworthy passengers.

If it be the King's highway it must be left open; if the unseen universe be a reality, surely we are not to dismiss it from our minds lest some people might entertain absurd views regarding its relation to the present visible universe. Such fancies are no new thing in the progress of knowledge. When two things are known to exist, we may have ten thousand erroneous hypotheses regarding their mutual relations, but only one true theory.

In the next place, we would say one word to that religious school which is more particularly affected by our present inquiry,—we mean the school who assert the resurrection of our material bodies, and a grossly material future state.

We have endeavoured to explain to this class of men that their belief is inconsistent with the integrity of that Principle of Continuity which underlies not only all scientific inquiry, but all action of any kind in this world of ours.

Under these circumstances such men have three honest alternatives before them.

In the first place they may acknowledge the truth of our position and change their views; or, secondly they may combat our argument regarding the alleged incompatibility of their position with the Principle

Continuity; or, lastly, they may decline to accept this scientific principle in matters which concern their faith. What we complain of is, that the members of this school have chosen none of these alternatives, but have rather attempted to brand us as infidels and materialists, apparently forgetting (as usual) that such a method of conducting a discussion is neither Christ-like nor convincing.

But while one class of religious men have tried to brand us with these names, those of another school consider our theology narrow and gloomy. We reply to these men that we do not pretend to be theologians in any sense of the word. Our position in this respect has been greatly misunderstood. We are, no doubt, endeavouring to bring about a reconciliation between science and religion. In order to accomplish this we must first find out what is the fundamental principle of science, next what is the fundamental creed of the great majority of Christians, and then endeavour to show that the two are not incompatible with each other. In carrying out this process we have been led to regard the Principle of Continuity as the great law which regulates scientific inquiry, and there cannot be a doubt that the Old and New Testaments are regarded as authoritative expositions of religious truth by the great majority of the Church of Christ.

Now we find that the expressions in the Scriptures regarding the future of man and the constitution of

the unseen world, taken in their obvious, if not absolutely literal meaning, are not inconsistent with scientific deductions from the Principle of Continuity.

We know very well that, especially of late years, a multitude of religious schools have risen up who take many of these expressions in a non-literal and far from obvious acceptation, and who, perhaps, do not accord the same authority to the writers as was formerly done. Into the disputes between these various religious schools we do not pretend to enter, nor do we see that the Shibboleths of such schools can be affected by our arguments, inasmuch as their discussions have, in the great majority of cases, nothing whatever to do with Physical principles. They are rather founded on historical, or moral, or metaphysical considerations, all of which are foreign to our argument.

Having no pretensions to a title which we certainly do not covet, we trust that we shall no longer be regarded as theologians either of a narrow and gloomy, or a lax and heretical school, or indeed of any school whatsoever.

September 1875.

PREFACE TO THE FOURTH AND FIFTH EDITIONS.

IN consequence of misapprehensions into which several of our critics have fallen, we have prefixed to this edition an Introduction wherein the objects of our work, and the mode in which we seek to attain them, are fully but compactly explained. We need therefore say nothing on these matters here. The work has been greatly enlarged, and in many parts almost rewritten; but we have nowhere found it necessary to alter or recall any of the statements hitherto made by us.

As we now give our names, we can at length complain of the conduct of a London 'Weekly,' which, only a few days after the first appearance of our book, took the (we hope) very unusual course of stating the authorship as a matter of absolute fact, not of conjecture. It was, of course, not authorised to do so, either by ourselves or by our Publisher:—and we regret to find that the exigencies of competition for public favour can be thought capable of

justifying, in the eyes of any one, such a course of conduct.

As Professors of Natural Philosophy we have one sad remark to make. The great majority of our critics have exhibited almost absolute ignorance as to the proper use of the term *Force*, which has had one, and only one, definite scientific sense since the publication of the *Principia*. As such men are usually among the exceptionally well educated, ignorance of this important question must be all but universal. In addition to what we have said on the subject in the text (§ 97), we would now only mention that the sole recorded case of true Persistency or Indestructibility of Force which we recollect having ever met with, occurs in connection with Baron Munchausen's remarkable descent from the moon. It is, no doubt, a very striking case; but it is apparently unique, and it was not subjected to scientific scrutiny.

B. STEWART. P. G. TAIT.

April 1876.

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INTRODUCTION.

THE present age is one of very rapid progress in almost all branches of knowledge.

Like a wave swelling as it advances shoreward, this progress has violently transformed whole regions of thought, while it has repeatedly invaded others which had not heretofore been deemed accessible to such catastrophes.

Presuming upon a soil of great natural richness, the inhabitants of these latter regions had for a long series of years given themselves up to a species of husbandry which was beginning at length to be detrimental in its effects.

It thus came to pass that while the immediate result of each inundation was a sudden alarm and consequent confusion, yet nevertheless a fertilising residuum was always left behind, together with a very plain intimation that no region of thought can permanently flourish if it be entirely cut off from any of the intellectual influences around it.

Suchlike, we take it, have been the results of the recent great floods of intellectual energy,

much of them seemingly subversive, which have repeatedly invaded the region occupied by the followers of Christianity. At present there is no book more read than the Bible, no life more deeply studied and discussed than the life of Christ. There is probably a greater amount of earnest attention devoted to these subjects than to any other branch of human inquiry. Nevertheless there is great confusion and an almost despairing outcry among many of the various legions in the Christian camp. It is imagined that fences and landmarks have disappeared, and that at length the rising tide is about to attack, as it has long threatened, the very lives and holdings of the inhabitants.

It will be our endeavour to reassure these somewhat over-timid people. Being students of physical science, we will try to gauge the strength of the tide, and more especially of the forces which give it motion, and endeavour to convince those who are sufficiently calm to receive conviction, that there neither is nor can be any real danger to their lives and holdings from the violence of the waters; but that, on the contrary, they will ultimately receive a blessing from that which will remain behind after the present confusion has disappeared.

'Skin for skin,' said a certain evil one, 'yea all that a man hath will he give for his

life,' and the proverb is true (with a modification) as regards the life of the soul, no less than as regards that of the body. Take away all hope of a future state,—appear to demonstrate, if not with absolute certainty, yet with an approach to it, that such a condition of things is antagonistic to well-understood scientific principles, and we feel certain that the effect upon humanity would be simply disastrous.

At any rate, those who propound an argument of this kind must reasonably expect determined opposition from the followers of religion.

Let us here, before proceeding further, take the opportunity of stating that we discuss only the *physical* aspects of the argument regarding a future state. Being neither metaphysicians nor moral philosophers, we leave to others more competent than we can be such proofs of immortality as may be derived from the universal craving among the intelligent races of mankind for a life beyond the grave.

In the present edition of our work, we have not materially altered our argument, but we have recast to some extent the shape in which it was first put before the reader.

The large amount of friendly criticism which our work has called forth has convinced us that we did not at first sufficiently separate between certain conclusions which inevitably

flowed from our argument, and certain others which, while deriving their strength from a totally different quarter, were yet not inconsistent with, but even, it might be, supported by the former. The consequence has been that we have found ourselves credited with attempts which were very far from our thoughts, such, for instance, as the endeavour to deduce Christian theological doctrine from mere physical considerations.

We have therefore thought it desirable to bring in review before the reader, in this introductory chapter, the fundamental points of our argument, more especially as in what follows we may not always be able without an undesirable formality to keep separate the foundation and the superstructure.

In his justly renowned *Analogy*, Bishop Butler begins with a chapter on a future life. He says with great truth that if there is an idea that death will be the destruction of living powers, that idea must arise either from *the reason of the thing* or *the analogy of nature.* 'But it does not arise (he proceeds to say) from *the reason of the thing;* for we do not know what death is. Again, we do not know on what the existence of our living powers depends; for we see them suspended in sleep, for example, or

in a swoon, and still not extinguished. Neither does it arise from *the analogy of nature;* for death removes all sensible proof, and precludes us consequently from tracing out any analogy which would warrant us in inferring their destruction.' Now, it is well known that since the days of Bishop Butler a school has arisen, the members of which assert that they have at length learned what Death is, and that in virtue of their knowledge they are in a position to tell us that life is impossible after death. It is one of the main objects of this volume to demonstrate the fallacy which underlies the argument brought forward by this school. We attempt to show that we are absolutely driven by scientific principles to acknowledge the existence of an Unseen Universe, and by scientific analogy to conclude that it is full of life and intelligence—that it is in fact a spiritual universe and not a dead one.

But while we are fully justified by scientific considerations in asserting the existence of such an unseen universe, we are not justified in assuming that we have yet attained, or can easily or perhaps ever attain, more than a very slight knowledge of its nature. Thus we do not believe that we can really ascertain what death is.

To those, therefore, who assert that there is no spiritual unseen world, and that death is an

end of the existence of the individual, we reply by simply denying their first statement, and in consequence of this denial, insisting that none of us know anything whatever about death. Indeed, it is at once apparent that a scientific denial of the possibility of life after death must be linked with at least something like a scientific proof of the non-existence of a spiritual unseen world. For if scientific analogy be against a spiritual Unseen, then evidently it is equally against the likelihood of life after death.

But if, on the other hand, we feel constrained to believe in a spiritual universe, then though it does not follow that life is certain after death, inasmuch as we do not know whether any provision has been made in this unseen world for our reception, yet it does follow that we cannot deny the possibility of a future life. For to do so would imply on our part such an exhaustive knowledge of the Unseen as would justify us in believing that no arrangement had been made in it for our transference thither. Now, our almost absolute ignorance with regard to the Unseen must prevent us from coming to any such conclusion.

We have been accused by some of our critics of being dogmatists. So far is this from being true that in the first part of our argument—

namely, that which relates to a spiritual unseen:—we are content to develop from the present recognised condition of things. We take the world as we find it, and are forced by a purely scientific process to recognise the existence of an Unseen Universe.

We are likewise led to regard the Unseen as having given birth to the present universe, a conclusion to which one of our leading critics has apparently given his assent.

Here, however, we join issue with the materialistic school. They continue to insist—against all analogy as we take it—that this Unseen Universe is a dead one, having no life worthy of the name, although it must have existed for inconceivable ages before the present Universe arose.

Let our readers remark that in all this we introduce no dogma—we do not require to assert or even assume the existence of God. We are content to develop our argument from a position which is common to our adversaries and to ourselves.

An objection has been raised that our argument tends to the Swedenborgian doctrine of a spiritual body. Now, the same principles which guide us from the continuous existence of the outer world to acknowledge an Unseen, lead us on the assumption of our own existence after death to acknowledge a spiritual body. In

other words, our conception of something which retains at once a hold upon the past and a possibility of future life assumes the form which we clothe in this language. But why Swedenborgian? Why not Pauline? Was it not the great Apostle who first gave utterance to his belief in these very words? If it be said to us that the way in which we regard the spiritual body is decidedly Swedenborgian, we would reply by asking our critics to tell us in what way we regard it.

We certainly hold that if we are to accept scientific principles, one of the necessary conditions of immortality is a spiritual body, but we as resolutely maintain that of the nature of this spiritual body we are and must probably remain profoundly ignorant.

It has likewise been objected that we do not sufficiently allow for the possibility that the present universe may be infinite, and that thus it might last for ever and continue, although spasmodically, to be the residence of living beings even in spite of the constant degradation of its energy. Unquestionably we cannot prove that the present visible universe is not infinite; this we have acknowledged in our work. But our chief argument is derived rather from the past than from the future. We maintain that the visible universe—that is to say the universe of

atoms—must have had its origin in time, and that while THE UNIVERSE is, in its widest sense, alike eternal and infinite, the universe of atoms cannot certainly have existed from all eternity.

While we freely confess that we cannot prove the finite magnitude of the universe of atoms, inasmuch as we cannot be sure that the stars which we see represent more than a small portion of this universe, we are unable to perceive any scientific principle which leads us to conclude that the number of such atoms must necessarily be infinite.

But whether it be finite or infinite, we have very great difficulty in imagining this universe to be eternal. Regarding the atom as something that has been developed from a previously existing unseen universe, we cannot readily believe it capable of lasting for ever. But if there be any element of decay in the material substance of the visible universe, the assumption of its present infinity will not enable us to predicate its future eternity.

Having thus defined our position, we may allow that in our past editions we have possibly given undue prominence to the particular argument in favour of an Unseen, which is derived from the future degradation of the energy of the present visible universe.

We come now to the second part of our subject. All that we have yet endeavoured to show is that the theory of a future life is not in any way whatever in contradiction to any ascertained facts or principles of science. But we have not succeeded in finding any proof that arrangements have been made in the Unseen world for our translation thither after death.

It has been shown that there is nothing in the whole range of science to lead us to suppose that life is impossible after death ; but we have yet to inquire what evidence, if any, exists in favour of a future state. Now it is well known that the followers of Christianity believe they have received such evidence in virtue of the resurrection of Christ, and it is equally well known that of late years a school of scientific men have arisen who reject such an event as one impossible to be believed.

It is not, however, rejected mainly because it is an uncommon event, or one unconfirmed by modern experience, for it is sufficiently well known that uncommon events have a recognised place in the universe. Thus, for instance, there are certain conjunctions of the planets which are very uncommon, and have not occurred in modern experience, but we do not hesitate for a moment to believe in the possibility of their occurrence. Nay, we are in a position to

go further, and to assert that at particular epochs of time, which we are capable of defining with greater or less precision, such uncommon conjunctions took place in the past, and will again take place in the future. An absolutely new comet, one which (from the fact that its orbit is hyperbolic) was probably never in the solar system before, and probably cannot again return to it, is by no means a rarity.

Now we believe that an extension of purely scientific logic drives us to receive as quite certain the occurrence of two events which are as incomprehensible as any miracle; these are:—the introduction of visible matter and its energy, and of visible living things into the universe. Furthermore, we are led by scientific analogy to regard the agency in virtue of which these two astounding events were brought about as an intelligent agency, an agency whose choice of the time for action is determined by considerations similar in their nature to those which influence a human being when he chooses the proper moment for the accomplishment of his purpose.

If this be true, the discussion regarding miracles must be removed altogether from the domain of science, and this for the very good reason that scientific logic admits the occurrence of events at least as astounding. The question is now rather one for the historian and the moral

philosopher to decide. The first of these is clearly bound to examine the evidence in favour of the life and resurrection of Christ, while the latter is bound to look around and ask what moral necessity there was for the interference of this peculiar intelligent agency, and also whether, as a matter of fact, the interference has proved beneficial.

But neither of these two ways of regarding the subject is at all cognate to our inquiry.

We simply show that a reception of the miracles of Christ leads to no intellectual confusion. Meanwhile, there are some who regard such a reception as tending to historical confusion, or to moral confusion, or to both; but with these sources of doubt we have nothing whatever to do. It may be thought by some of our readers that here our discussion ought to end; but, as it appears to us, there yet remains another point vitally connected with our inquiry. There is, perhaps, hardly a human being who seriously questions the moral beauty of the character of Christ; there are many who question the truth of the miracles recorded as having been wrought by Him; while still more, it may be, question the truth of certain of His sayings, especially such as have reference to the constitution of the Unseen world.

Entertaining the most profound reverence for

Christ Himself, many of the latter class, rather than believe that Christ enuntiated the doctrine to which they object, maintain that it may have been a late human fiction which grew up with and finally incrusted itself around the true sayings of Christ: some again maintain that the sayings were really those of Christ, but insist that the common interpretation of them is erroneous. On this account we conceive that in order to complete our programme we should extend our inquiry beyond the miracles of Christ so as to embrace those of His sayings which have reference to Himself and to the constitution of the Unseen world. We are thus led to the consideration of another subject, which is, we venture to think, intimately connected with that which appears on our title-page; and in this respect the Bishop of Manchester has very clearly defined our position by stating that (*from a purely physical point of view*) we contend for the possibility of immortality and of a personal God.

We must now, however, start from a new basis and assume the existence of a Deity who is the Creator and Upholder of all things. It is not our intention to enter into the argument by which the existence of a Deity may be derived from a consideration of His works. Here, therefore, we must necessarily part com-

pany with our materialistic friends, for while they may have been content to go along with us in our first argument to a greater or less length, they will most assuredly not even set foot upon the second stage of our journey. We cannot help it.

Assuming therefore the existence of a Deity, who is the Creator and Upholder of all things, we further look upon the laws of the universe as those laws according to which the beings in the universe are conditioned by the Governor thereof, as regards time, place, and sensation.

Nothing whatever lies, or can be even conceived to lie, outside of this sovereign and paramount influence. There is no impression made upon the bodily senses—no thought or other mental operation which does not take place in conformity with this expression of the will of God.

If it be asked how we can imagine any free will or moral responsibility to exist consistently with this doctrine, we may reply that we cannot tell in virtue of what peculiar constitution of things the sovereignty of God is consistent with our moral responsibility, nor can we even conceive the possibility of our obtaining the knowledge requisite to reply to this question. But it may, we think, be shown that the doctrine of the sovereign power of God as above defined is not inconsistent with moral responsibility.

For in the statement made three things are spoken of. *In the first place*, there is God, the source of power; *secondly*, there are the conditions which He imposes; and *thirdly*, there is the Ego, the being who is thus conditioned. Now, the laws of thought absolutely forbid our dismissing this Ego. It may possibly be argued that we consist of a bundle of sensations bound together, just as a bundle of threads are, by something which is no less a sensation, namely, the impression that we have an individual existence; to which we would reply that even if this be granted we must submit to impressions from which there is no escape.

Now, it appears to us that we cannot possibly have any impression more deeply seated or more impossible to uproot than this :—that we ourselves exist; it is something which we continually carry about with us, even into the grotesque regions of thought, where all individuality is denied. It is into these regions that the materialists invite us to accompany them in order to perform, or rather to delude ourselves with the idea that we have performed, this singularly unhappy despatch! But, just as we cannot conceive of a man devouring himself, so neither can we conceive of his getting rid of his own individuality by any legitimate process of thought. Can we conceive of consciousness

without a being who is conscious? or of sensation without a being who feels? We may perhaps take it for granted that the statements we have now made, acknowledging at once a Sovereign Power and our own moral responsibility, will commend themselves to a large body of thinkers who will virtually agree with our conclusions. It is to these we would now address ourselves, inviting them to accompany us upon the second stage of our journey.

Let us here, therefore, regarding ourselves as moral and intellectual beings, bear in mind that there are various avenues through which we receive instruction. We do not, of course, mean that these avenues are absolutely separate from each other, inasmuch as they must all somehow or other merge into the one grand avenue through which we perceive the Sovereign Power of God. Such avenues are,—the study of matter and its laws,—communion with our fellows, and —example.

Now why should not all these various avenues be filled with the knowledge of God, thus effecting the displacement of a vast throng of mean and loathsome influences which would otherwise run riot there?

Surely that must be a singular process of reasoning by which the Most High is altogether banished from these avenues into which it is

alleged He cannot possibly condescend to enter. We are confident there is some misapprehension here; let us therefore try to point out its probable nature.

We have assumed that a study of creation leads us up to some conception of God—that we are driven by the faculties which He has given us to acknowledge the existence of a Paramount Power, and inasmuch as scientific thought leads us to regard THE UNIVERSE as both infinite and eternal, so are we driven to regard this Power which underlies all phenomena as infinite and eternal also.

This at least appears to us to be the conclusion to which we are driven if we endeavour to reduce mental confusion to a minimum. It is, however, manifestly absurd to imagine that by means of this process we can ever comprehend the essential nature of God. We can no more comprehend His essential nature by this means than we can the essential nature of matter or of life. But surely we can judge of His character by the various modes in which He influences us, and indeed all scientific generalisations—even the simple conclusion that the sun will rise to-morrow—are in a sense expressions of our faith in the unchanging character of God. Now if we examine the process by which we have obtained this conception of God

it will be seen that we start with a single intellectual being who is applying himself to a scientific study of the works of nature. The idea of our neighbour does not enter into it, and we agree to regard ourselves as intellectual rather than as moral or social beings. The result is that having voluntarily confined our argument to one channel, we obtain a knowledge of God's character—that is to say, of His manifested relations towards us—which is necessarily incomplete. But are we therefore entitled to say: —Because we obtain a very imperfect conception of God by this method, we will not believe there is any other method by which this conception may be rendered more complete?

Sound argument, it appears to us, leads the other way altogether. For if we assume that the knowledge of God derived from one source is incomplete, ought we not to try whether it can be supplemented by knowledge derived from other sources? Undoubtedly if other sources furnish, or seem to furnish, conceptions of God which are fundamentally inconsistent with that which we have derived through the scientific channel, we are entitled to sit in intellectual judgment upon them until the source of confusion is in some way removed.

But does this inconsistency as a matter of fact exist? We do not think it does. The

statements in the New Testament scriptures regarding God are necessarily mysterious, but mystery can be no test of their truth or falsehood, inasmuch as it must in such regions be the almost inevitable accompaniment of truth.

The question is not whether they are mysterious, but whether they are consistent with themselves, and with the knowledge we derive from other sources. We therefore devote considerable portions of this volume to a proof that the conception of God which the majority of Christians derive from the New Testament is in no way inconsistent with that deduced from scientific principles.

Meanwhile, and in conclusion, we must be allowed to express our conviction that much evil has been wrought by a certain class of sincere and well-meaning men in the various churches of Christ. By dint of contemplating lofty truths from one point of view, and only one, and by dint of developing excessively, and in one direction only, those analogies by which the mysterious has been rendered thinkable, they have produced a result for which they themselves are mainly to blame. With a strange reversal of the process by which Satan transforms himself into an Angel of Light, we have the noble, the beautiful, and the true presented to us by these men in a form which is

fit only to inspire aversion or to create disgust.

It is in such terms that we reply to those of our critics, on the one hand, who attack us for adopting what they call a narrow and gloomy theology; and to those, on the other hand, who regard as dangerous the method of discussion we have pursued. We have tried honestly to view things with two eyes,—the eye of knowledge and the eye of faith: first with one, then with the other, finally with both. To what extent we have succeeded is, after all, a matter of minor importance if only the lawfulness of this mode of vision be ultimately allowed. And just as we have a better appretiation of the form and distance of natural objects when we view them with both our physical eyes, so, we venture to think, must it prove with the truths of which we now speak.

We have explained that the first part of our argument is altogether independent of revelation; proceeding as it does solely upon scientific data, and the conclusions which these seem to render inevitable. In the second part, however, we feel that we ought not to deprive ourselves of the overwhelming additional evidence which we derive from Christian records. Here, therefore, we shall neither gratify one class of our

critics by starting from a point which ignores what we regard as the fully warranted belief of the great majority of Christians, nor shall we be overruled by the excessive timidity of another class who apparently regard a two-eyed man as a monster in those regions where truths of really vital importance are concerned.

The horrors and blasphemies of Materialism are at least every first day of the week so fully treated by many theologians that it is almost unnecessary for us to say anything on their view of the subject, especially as we could not compete with the great majority of them in strength and happy audacity of language. We would therefore content ourselves with mildly inquiring what sort of regard for the image of the Divine in humanity is shown by those whose creed levels us all with 'the beasts that *perish*.' Even the antient Pagans were less disposed to such monstrosities :—

'. . . . . .
finxit in effigiem moderantum cuncta Deorum.
pronaque cum spectent animalia cetera terram,
os homini sublime dedit : cœlumque tueri
jussit, et erectos ad sidera tollere vultus.
sic, modo quae fuerat rudis et sine imagine, tellus
induit ignotas hominum conversa figuras.'

It is well for the human race that such sophistical doctrines as those of Materialism

are as yet received by a small minority only. 'If in this life alone we have hope,' we should be led by common sense and prudence to make the best of it, our neighbour's sufferings notwithstanding. At least we should listen to him only as did the judge 'who neither feared God, nor regarded man,' when he said, 'This widow troubleth me; I will avenge her, lest by her continual coming she weary me.'

We would conclude by observing that the natural disinclination to receive as true a religion whose very first effect is 'to convict the world of sin,' is admirably set forth in the striking words of Peter[1]: 'Depart from me, for I am a sinful man, O Lord.'

[1] See also Job xxi. 14, 15.

CHAPTER I.

INTRODUCTORY SKETCH.

'L'immortalité de l'âme est une chose qui nous importe si fort, et qui nous touche si profondément, qu'il faut avoir perdu tout sentiment pour être dans l'indifférence de savoir ce qui en est.'—PASCAL.

'For he should persevere until he has attained one of two things; either he should discover or learn the truth about them, or, if this is impossible, I would have him take the best and most irrefragable of human notions, and let this be the raft upon which he sails through life—not without risk, as I admit, if he cannot find some word of God which will more surely and safely carry him.'—PLATO'S *Phædo*; translated by JOWETT.

1. THE great majority of mankind have always believed in some fashion in a life after death; many in the essential immortality of the soul; but it is certain that we find many disbelievers in such doctrines who yet retain the nobler attributes of humanity. It may, however, be questioned whether it be possible even to imagine the great bulk of our race to have lost their belief in a future state of existence, and yet to have retained the virtues of civilised and well-ordered communities.

We have said that the disbelievers in such doctrines form a minority of the race; but at the same time it must be acknowledged that the strength of this minority has of late years greatly increased, so

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much so that at the present moment it numbers in its ranks not a few of the most intelligent, the most earnest, and the most virtuous of men.

It is, however, possible that, could we examine these, we should find them to be unwilling disbelievers, compelled by the working of their intellects to abandon the desire of their hearts, only after many struggles, and with much bitterness of spirit.

Others, again, without absolutely abandoning all hope of a future existence, are yet full of doubt regarding it, and have settled down into the belief that we cannot come to any reasonable conclusion upon the subject. Now, these men can have had nothing to gain, but rather much to lose, in arriving at this result. It has been reached by them with reluctance, with misgivings, not without a certain kind of persecution, nor without the loss of friends and the stirring up of strife; still they have fearlessly looked things in the face, and have followed whithersoever they imagined they were led by facts, even to the brink of an abyss.

It is the object of the present volume to examine the intellectual process which has brought about such results, and we hope to be able to show not only that the conclusion at which these men have arrived is not justified by what we know of the physical universe, but that on the other hand there are many lines of thought which point very strongly towards an opposite conclusion.

2. A division as old as Aristotle separates[1] speculators into two great classes,—those who study the How of the Universe, and those who study the Why.

[1] See *Westminster Sermons*, by the Rev. Charles Kingsley.

All men of science are embraced in the former of these, all men of religion in the latter. The former regard the Universe as a huge machine, and their object is to study the laws which regulate its working; the latter again speculate about the object of the machine, and what sort of work it is intended to produce. The disciples of How are accused by their adversaries of being willing to sacrifice the individual to the system; while the disciples of Why are accused by *their* adversaries of being willing to sacrifice the system to the individual.

We may compare the Universe to a great steamer plying between two well-known ports, and carrying two sets of passengers. The one set remain on deck and try to make out, as well as they can, the mind of the Captain regarding the future of their voyage after they have reached the port to which they know they are all fast hastening, while the other set remain below and examine the engines. Occasionally there is much wrangling at the top of the ladder where the two sets meet, some of those who have examined the engines and the ship asserting that the passengers will all be inevitably wrecked at the next port, it being physically impossible that the good ship can carry them further. To whom those on deck reply, that they have perfect confidence in the Captain, who has informed some of those nearest him that the passengers will not be wrecked, but will be carried in safety past the port to an unknown land of felicity. And so the altercation goes on; some who have been on deck being unwilling or unable to examine the engines, and some who have examined the engines preferring to remain below.

3. Our readers will perceive from what we have said, that difficulties regarding the possibility of a future state of existence are most likely to arise amidst the disciples of How or those who study the machinery of the Universe, and inasmuch as this class has greatly increased of late, it follows that the disbelievers in or doubters of the future state have increased likewise. The disciples of Why have, on the other hand, existed from time immemorial, and have, in the plenitude of their power, frequently carried themselves with much violence towards the disciples of How, who are of comparatively modern origin. It must not, however, be inferred that this old and venerable family have always been at peace amongst themselves, for there have been numerous contentions among their various sections, not the less acrimonious because the contending members have been to some extent supporters of a common cause, believing in some fashion in the reality of a world to come. We shall therefore begin by giving our readers a sketch, necessarily and purposely a very meagre one, of the various beliefs on these subjects held by the different branches of this great family.

4. Let us begin with the Egyptians, who are perhaps the most ancient people of whom we have historical records. The manners and customs of this nation have been very minutely described by Sir Gardner Wilkinson, to whose work we are chiefly indebted for the following account. In the first place it appears that we must separate between what the priests believed and what was held by the great body of the people. The bulk of the nation were left by the priests to believe in a multiplicity of deities, and

even to reverence animals as divine, while on the other hand the higher orders of the priesthood, who were initiated into the greater mysteries of their religion, appear to have acknowledged the unity of God. These believed in one Eternal God, from whom all other deities were produced, and whom they did not permit themselves even to name, far less to represent under any visible form. The Egyptians likewise believed in the existence of Dæmons or Genii, who were present unseen amongst mankind.

5. The earliest Egyptian records attest the belief of this nation in the immortality of the soul:—'Dissolution, according to them, is only the cause of reproduction—nothing perishes which has once existed, and things which appear to be destroyed only change their natures and pass into another form.'[1]

Anubis held in Egypt an office similar to that of Mercury among the Greeks, being the usher of souls in their passage to the future state. Amenti was the region to which the souls of men were supposed to go after death, and Sir Gardner Wilkinson notices the resemblance between this name and that of Ement 'the West'—the west, where the sun was seen to sink, being looked upon as the end of the world. The guardian of the lower regions was called Ouom-n-Amenti, or the Devourer of Amenti. It had frequently the appearance of a hippopotamus, but was drawn sometimes with the head of a fanciful creature something between the hippopotamus and the crocodile.

'The judgment of the soul was conducted by Osiris, aided by forty-two assessors, supposed to represent

[1] Wilkinson.

the forty-two crimes from which a virtuous man was expected to be free when judged in a future state, or rather the accusing spirits, each of whom examined if the deceased was guilty of the peculiar crime which it was his province to avenge.'[1]

6. As regards the fate of the soul when once the judgment had been passed upon it,—the Egyptians considered the souls of men to be emanations of the Divine soul, and each was supposed to return to its Divine origin when sufficiently pure to unite with the Deity. On the other hand, those who had been guilty of sin were doomed to pass through a series of torments ending in the second death.

7. It is considered probable by some that the Egyptian custom of embalming the body had relation to this religious doctrine, and before the mummy was allowed burial it had to be judged and acquitted by terrestrial authorities. Diodorus gives a detailed account of the ceremonies which then took place, in which forty-two judges were summoned to act as assessors and determine the fate of the body. If it could be proved that the deceased had led an evil life, his body was deprived of the accustomed burial, and on such occasions the grief and shame felt by the family were excessive. Diodorus considers that this was in itself a strong inducement to every one to abstain from crime, and praises very strongly the authors of so wise an institution.

8. Let us next consider the ancient belief of the Hebrew nation.

Referring to the records of this nation, we find that at an early period they had been slaves or serfs to

[1] Wilkinson.

the Egyptians, from whom they were delivered by Moses, who became afterwards their lawgiver. Moses had by a species of adoption obtained a very prominent position among the Egyptians, and had probably been initiated into their sacred mysteries, for we read that he was 'learned in all the wisdom of the Egyptians.' Without discussing the question of inspiration, we may readily imagine that, himself a believer in the unity of God, this sagacious leader must have perceived the deficiency of a religious system in which the truth was confined to a few, while the many were allowed to remain in the most degrading idolatry.

He was thus in a fit state to recognise the paramount importance of the whole mind and mass of the nation being pervaded with a belief in one invisible, ever-present, ever-living God. We do not, however, mean to assert that Moses got his religious notions from Egypt, but we think it possible that his mind may have been prepared by the failure of the Egyptian system to receive a better one.

9. In the Egyptian system there were two peculiarities which were probably connected together. We have seen (Art. 4) that amongst the higher orders of the priesthood there was a profound, but at the same time a superstitious, reverence for the name of God, who was unnamed and unapproachable, unless under some deified attribute. At the same time there was, and probably in consequence of the former, an ignorance of the unity of God amongst the great mass of the people, and a worship of the various deified attributes of one supreme being as so many separate divinities.

10. Now the task which Moses believed himself

divinely commissioned to accomplish was the revelation of this one living and ruling God to the whole body of his countrymen. Thus we find God, in the sacred writings of the Jews, saying to Moses, 'I am the LORD (Jehovah), and I appeared unto Abraham, unto Isaac, and unto Jacob, by the name of God Almighty (El Shaddai); but by my name Jehovah was I not known to them.'[1] We do not however intend to discuss the precise meaning of the two names of God, which we find in the Hebrew Scriptures—sufficient for us that Moses endeavoured to impress upon his people the unity and ever-living presence of the Divine Being.

11. Again, it would appear that the Jews, in addition to their belief as a nation in the unity of God, believed also in the reality of an invisible world containing spiritual intelligences, some of whom were the loyal servants and messengers of God, while others delighted in the endeavour to thwart His counsels, and were in rebellion against Him. Apparently both orders of these were supposed to have very considerable power, not only over the minds and bodies of men, but also over the operations of nature. Thus two angels were commissioned by God to destroy Sodom;[2] and again, in the poem of Job, when Satan received power over the Patriarch, he overwhelmed him by at once inciting robbers who plundered his substance, killing his children by a wind from the wilderness, and finally smiting the body of Job himself with a loathsome disease.

It is perhaps worthy of note that while we read in these records of various appearances of good spirits

[1] Exod. vi. 2. [2] Gen. xix. 12.

in the human form, we have no certain account of any such manifestation of evil spirits. It may even be supposed that a good deal of the Demonology of Scripture belongs to poetic or semi-parabolic representation of spiritual truths. Thus Coleridge and others have thought that the Satan of Job is only the dramatic accuser or adversary imagined by the poet.

12. Very little is said about man's future state in the Scriptures of the Jews. The Hebrews, like the Assyrians and Chaldeans, believed in Sheol (Hades), a dark and gloomy abode peopled by the shades of the dead. But the continued existence of the 'pithless' shades (Rephaim) in this land of powerlessness and forgetfulness was not thought of as constituting immortality, but rather as the essence of death itself. The religious hope of immortality which appears in some passages of the Old Testament takes the form of a victory over or rescue from the fear of Sheol. But this higher hope was not brought before the mind of the Hebrew nation in the same way as was the presence and unity of God. It seems to us that Dean Stanley's conjecture is probably correct where he says, with reference to this omission, 'Not from want of religion, but (if we might use the expression) from excess of religion, was this void left in the Jewish mind. The future life was not denied or contradicted, but it was overlooked, set aside, overshadowed by the consciousness of the living, actual presence of God Himself. That truth, at least in the limited conceptions of the youthful nation, was too vast to admit of any rival truth, however precious. When David or Hezekiah shrank from the gloomy vacancy of the

grave, it was because they feared lest, when death closed their eyes in the present world, they should lose their hold on that Divine friend with whose being and communion the present world had in their minds been so closely interwoven.'[1]

13. As the nation grew older we find frequent and distinct allusions indicating a belief in a resurrection of some kind. Thus we find the angel saying to Daniel, 'And many of them which sleep in the dust of the earth shall awake, some to everlasting life, and some to shame and everlasting contempt. And they that be wise shall shine as the brightness of the firmament; and they that turn many to righteousness as the stars for ever and ever.'[2] And again: 'Go thy way till the end be; for thou shalt rest and stand in thy lot at the end of the days.'[3] Again, in the Apocrypha, we find one of seven brethren who were put to death by Antiochus, saying to that tyrant,—'It is good, being put to death by men, to look for hope from God, to be raised up again by Him; as for thee, thou shalt have no resurrection to life,'[4] and the other brethren spoke in like manner. Here it is evident from the whole chapter that the hope expressed was rather the result of perfect trust in God than derived from any process of their own reason, or even from any revelation on the subject which they imagined to have been made.

We have likewise the testimony of Josephus as well as of the New Testament that the Pharisees believed in a resurrection. Josephus tells us,—'They [the Pharisees] say that all souls are incorruptible,

[1] *Lectures on the Jewish Church.*
[2] Dan. xii. 2.
[3] Dan. xii. 13.
[4] 2 Macc. vii. 14.

but that the souls of good men only are removed into other bodies, but that the souls of bad men are subject to eternal punishment.'[1] Again, we learn from the same two authorities that the Sadducees held sceptical notions on the subject, and Josephus says—'They take away the belief of the immortal duration of the soul, and the punishments and rewards in Hades.'

14. If we next turn to the Greek and Roman mythologies we find ideas of a future state very similar to those entertained by the Egyptians, from whom probably the Greek notions were originally largely derived.

They called by the name of Elysium the abode appropriated to the souls of the good, while those of the wicked suffered punishment in Tartarus. It has been well remarked by Archbishop Whately that these regions were supposed to be of the most dreamy and unsubstantial nature:—

'The poet [remarks Whately] from whom so many were content to derive their creed [meaning Homer] represents Achilles among the shades as declaring that the life of the meanest drudge on earth is preferable to the very highest of the unsubstantial glories of Elysium:—

> Βουλοίμην κ' ἐπάρουρος ἐὼν θητευέμεν ἄλλῳ,
> Ἀνδρὶ παρ' ἀκλήρῳ, ᾧ μὴ βίοτος πολὺς εἴη,
> Ἢ πᾶσιν νεκύεσσι καταφθιμένοισιν ἀνάσσειν.

It is remarkable too that the same poet seems plainly to regard the *body* not the *soul* as being properly "the man" after death has separated them. *We* should be

[1] *Wars of the Jews*, II. viii. 14.

apt to say that such a one's body is here, and that *he*, properly the person himself, is departed to the other world; but Homer uses the very opposite language in speaking of the heroes slain before Troy: viz., that their souls were despatched to the shades, and that THEY themselves were left a prey to dogs and birds:—

Πολλὰς δ' ἰφθίμους ΨΥΧΑΣ Ἄϊδι προΐαψεν
Ἡρώων, ΑΥΤΟΥΣ δὲ ἑλώρια τεῦχε κύνεσσιν.'[1]

We agree with this writer that the belief in an unsubstantial region of this description can have had no real influence either in deterring men from vice, or in encouraging them to virtue. Indeed its inevitable tendency must have been to foster an undue regard for the pleasures of this present life to the absolute discouragement of goodness and virtue. For while we of the present day regard the future life as in some sense the reward of piety and goodness, the ancients looked upon Hades rather as a penalty which inexorable fate had reserved for all men, and from which even piety and goodness were powerless to exempt their possessors.

Cum semel occideris, et de te splendida Minos
Fecerit arbitria;
Non, Torquate, genus, non te facundia, non te
Restituet pietas.
Infernis neque enim tenebris Diana pudicum
Liberat Hippolytum;
Nec Lethæa valet Theseus abrumpere caro
Vincula Pirithöo.

15. The active-minded as well as the gross-minded members of the community could hardly be expected to care much for such an unsubstantial future, and

[1] *Essays on some of the Peculiarities of the Christian Religion.*

this consideration may probably have led to the readier acceptance of the doctrine of some of the Greek philosophers who introduced a bodily state after death. But these, in so doing, rather favoured the doctrine of transmigration than that of a resurrection of the body which was seen to die, and which, after being devoured by dogs, or destroyed in some other manner, they could hardly conceive to rise again. It is well known that Pythagoras taught the doctrine of transmigration, although as none of his writings have come down to us we are not sure of the exact manner in which he held it. Plato also alludes to a similar doctrine, in a passage which refers no doubt to the doctrine of the pre-existence of souls, and to the view that it is a punishment to become corporeal at all. He tells us :— 'If any one's life has been virtuous he shall obtain a better fate hereafter ; if wicked a worse. But no soul will return to its pristine condition till the expiration of ten thousand years, since it will not recover the use of its wings until that period, except it be the soul of one who has philosophised sincerely or together with philosophy has loved beautiful forms. These indeed in the third period of a thousand years, if they have thrice chosen this mode of life in succession, . . . shall in the three thousandth year fly away to their pristine abode, but other souls, being arrived at the end of their first life, shall be judged. And of those who are judged, some, proceeding to a subterraneous place of judgment, shall there sustain the punishments they have deserved ; but others, in consequence of a favourable judgment, being elevated into a certain celestial place, shall pass their time in a manner

becoming the life they have lived in a human shape. And in the thousandth year both the kinds of those who have been judged, returning to the lot and election of a second life, shall each of them receive a life agreeable to his desire. Here also the human soul shall pass into the life of a beast, and from that of a beast again into a man if it has first been the soul of a man. For the soul which has never perceived the truth cannot pass into the human form.'[1] A certain degree of choice is here supposed to be left to the soul, and those who cannot attain to the more ethereal and refined existence, have to choose a bodily one, returning, after they have become sufficiently purified, once more into human shape.

16. As a matter of course, a dim belief of this nature gave rise to a class of philosophers who denied the possibility of a future state altogether. The advent of this school of thought was probably hastened by outward events. In the golden age of Greece a vigorous republic served to concentrate upon itself the energies of the citizens, and under these circumstances their minds were not likely to question the truth of the national creed. While the gods smiled upon them they were content to acknowledge their active existence. It has been remarked by Schmitz, that the unfavourable political circumstances of the time may have been concerned in the rise of the Epicurean school—'thinking men were led to seek within for that which they could not find without.' The gods of Epicurus, this writer goes on to remark, 'consisted of atoms, and were in the enjoyment of perfect happiness, which had not been disturbed by

[1] *Phædrus*, quoted by Wilkinson.

the laborious business of creating the world, and as the government of the world would interfere with their happiness, Epicurus conceived them as exercising no influence whatever upon the world or man.'

It is of such gods the poet speaks when he says :—

'For they lie beside their nectar, and the bolts are hurl'd
Far below them in the valleys, and the clouds are lightly curl'd
Round their golden houses, girdled with the gleaming world
Where they smile in secret, looking over wasted lands,
Blight and famine, plague and earthquake, roaring deeps and fiery sands,
Clanging fights, and flaming towns, and sinking ships and praying hands.'

The ancient Roman poet Lucretius, in his well-known poem 'De Rerum Natura,' has beautifully interpreted the Epicurean philosophy. Adopting like Epicurus the atomic or corpuscular theory of things, he tells his readers that the soul of man perishes along with the body, and that it is the height of folly for man to be afraid of that which may happen to him after death.

17. It is unnecessary to discuss in detail the tenets of the various Greek and Roman philosophers. A number of indefinite and sometimes contradictory expressions sufficiently betray the uncertainty of their opinions. Desirous, it may be, themselves to believe—desirous at least that the body of their countrymen should believe—in a future state, yet it is not wonderful that they should have felt strongly the difficulty of believing, or have expressed their doubts in writings which were not intended to be read by the great mass of the people.

18. Proceeding now to the extreme east, it is well known that of late years very great light has been

thrown upon the ancient religions of the Brahmans, the Magians, and the Buddhists. In an admirable collection of essays by Professor Max Müller,[1] we have a good epitome of what has been accomplished by the laborious investigations of oriental scholars. We learn from these that the most ancient document is the Rig-Veda, or Sacred Hymns of the Brahmans, in which we have the religious belief of a large section of the Indo-Germanic race at a period supposed to be from 1200 to 2000 years before the Christian era. In these hymns the gods are called Deva, a word which is conjectured to be the same with the Latin Deus. 'It would be easy,' says Max Müller, 'to find in the numerous hymns of the Veda passages in which every important deity is represented as supreme and absolute. Thus in one hymn, Agni (fire) is called "the ruler of the universe." . . . . In another hymn, another god, Indra, is said to be greater than all. "The gods," it is said, "do not reach thee, Indra, nor men,—thou overcomest all creatures in strength." . . . . Another god, Soma, is called the king of the world, the king of heaven and earth, the conqueror of all. . . . . Another poet says of another god, Varuna, "Thou art lord of all, of heaven and earth; thou art the king of all, of those who are gods, and of those who are men." . . . . This surely,' remarks Max Müller, 'is not what is commonly understood by Polytheism. Yet it would be equally wrong to call it Monotheism. If we must have a name for it, I should call it Kathenotheism. The consciousness that all the deities are but different names of one and the same godhead, breaks

[1] *Chips from a German Workshop.*

forth indeed here and there in the Veda. But it is far from being general. One poet for instance says, "They call him Indra, Mitra, Varuṇa, Agni; then he is the beautiful-winged heavenly Garutmat—that which is one, the wise call it, in divers manners; they call it Agni, Yama, Mâtariśvan."'

19. We learn from the same author that 'there is in the Veda no trace of metempsychosis, or that transmigration of souls from human to animal bodies, which is generally supposed to be a distinguishing feature of Indian religion. Instead of this we find what is really the *sine quâ non* of all real religion, a belief in immortality and in personal immortality. . . Thus we read, He who gives alms goes to the highest place in heaven; he goes to the gods. . . . . Again we find this prayer addressed to Soma:—

'Where there is eternal light, in the world where the sun is placed, in that immortal, imperishable world place me, O Soma!

'Where King Vaivasvata reigns, where the secret place of heaven is, where these mighty waters are, there make me immortal!

'Where there is happiness and delight, where joy and pleasure reside, where the desires of our desire are attained, there make me immortal!'

Max Müller further remarks, that the Rig-Veda contains allusions, although vague, to a place of punishment for the wicked. 'The dogs of Yama, the king of the departed, present some terrible aspects, and Yama is asked to protect the departed from them. Again, a pit is mentioned, into which the lawless are said to be hurled down, and into which Indra casts those who offer no sacrifices.'

20. A religion like this, however pure at its commencement, was likely soon to become corrupted. It speedily merged into idolatry and polytheism, as far at least as the main body of the worshippers were concerned, while at the same time the rule of the Brahmans or officiating priests became strengthened into an insupportable social tyranny. Thus a double reformation was to be apprehended, corresponding on the one hand to the religious, and on the other to the ceremonial and social, development of the system.

21. The first reformation was that attributed to Zoroaster and his disciples, whose belief is contained in the Zend-Avesta. In his confession of faith, the disciple of the Eranian or Zoroastrian religion declares, 'I cease to be a worshipper of the daêvas.'

It must however be remembered that in this religion *daeva* means *devil*, or evil spirit. Thus the earliest forms of the Zoroastrian religion need not have excluded, and apparently did not exclude, the worship of good spirits.

Whilst the Zoroastrian disciples believed in a supreme God who rules the world, they yet gave a prominent place to a spirit of evil, which afterwards received the name of Ahriman, and was supposed to exercise very considerable influence over the order of nature and the minds of men. Indeed, Ahriman is apparently an independent power so strong that but for the fact that he acts before he thinks, while Ormuzd (the good spirit) thinks before he acts, the victory of good would be doubtful. The whole system hinges on this and on the fact that everything noxious and evil in creation is the work of Ahriman.

Max Müller is of opinion that 'the Zoroastrian

religion was founded on a solemn protest against the whole worship of the powers of nature involved in the Vedas;' and again the same writer says, 'The characteristic change that has taken place between the Veda and Avesta is, that the battle is no longer a conflict of gods and demons for cows (alluding to a Vaidik myth), nor of light and darkness for rain. It is the battle of a pious man against the power of evil.'

22. The disciples of the Zoroastrian religion believed in a future state; the ill-speaker (the devil), we are told in the Zend-Avesta, shall not destroy the second life.

The following extracts given by Max Müller from a catechism of the modern Parsis or disciples of Zoroaster give us a very good idea of their present creed:—

'Q. Whom do we of the Zarthosti community believe in?

'A. We believe in only one God, and we do not believe in any besides Him.

'Q. Do we not believe in any other God?

'A. Whoever believes in any other God but this is an infidel, and shall suffer the punishment of hell.'

In another extract the disciples are told that in the world to come they shall receive the return according to their actions.

23. The next reform of the Brahminical system had reference to its social characteristics, and was occasioned by the insupportable tyranny of the priesthood. The reformer, a young prince, was born about 500 years B.C., and from his life and doctrines received the name of Buddha, or the Enlightened.

After having learned from various famous Brahmans, he came to the conclusion that their austerities and doctrines could neither free men from the miseries of this life nor from the fear of death. From this stage Buddha passed into the belief that all we see is vanity—a delusion, a dream—and that the highest wisdom consists in perceiving this, and in desiring to enter into Nirvâ*n*a, or, in other words, to be blown out like a flame.

It would seem from these words that Buddha himself regarded annihilation rather than immortality as the *summum bonum;* but no account of Buddhism would be satisfactory which did not pay special regard to the notion so widely diffused in heathenism, that matter is the source of all evil. To be liberated from *matter* is to be liberated from *evil;* and this would seem to be the fundamental thought in the Nirvâ*n*a in all its different senses. But however this may be, we know that, allied to these extreme metaphysical opinions, Buddha inculcated a moral code which is one of the purest the world has ever known. M. Laboulaye says, 'It is difficult to comprehend how men not assisted by revelation could have soared so high;' and M. Barthélemy Saint-Hilaire does not hesitate to assert that 'with the sole exception of Christ, there is not amongst the founders of religion a more pure or touching figure than that of Buddha.'

24. In process of time, among the followers of the Buddhist religion, the word Nirvâ*n*a came to have a very different meaning from that which it had at first. Buddha was himself worshipped as a divinity, and his Nirvâ*n*a came to denote a state in which

there was a total absence of pain, or in other words an Elysium.

In illustration of this we may quote the account given by Max Müller of the dying words of Hiouen-thsang, a famous pilgrim from China to the shrine of Buddha, who died in the year of our era 664:—

'I desire,' he said, 'that whatever merits I may have gained by good works may fall upon other people. May I be born again with them in the heaven of the blessed, be admitted to the family of Mi-le, and serve the Buddha of the future who is full of kindness and affection. When I descend again upon earth, to pass through other forms of existence, I desire at every new birth to fulfil my duties towards Buddha, and arrive at the last at the highest and most perfect intelligence.'

25. Having thus surveyed, however imperfectly, the belief regarding a future state held by the greater nations both of the East and West before the advent of Christianity, let us now make a few observations.

In the first place, there are manifestly two ways in which such a belief may be held. In one of these it becomes the natural result of an implicit faith in God and his goodness, which will not suffer him to disappoint the natural and innate longings of his intelligent creatures. And such a belief is most likely to arise amongst a nation which has already vividly realised the living presence and goodness of God. Now the ancient Jews were such a nation, and the belief that even death cannot break the fellowship of the believer with God comes out clearly enough in several of the Psalms. Moreover, the notion of some sort of future life lies clearly in what is said of

Enoch. All this goes beyond the mere notion of Sheol, which is not thought of as a happy place. But in the time of the Maccabees this had grown into a definite belief in the resurrection, and without insisting on the truthfulness of the Second Book of Maccabees as an historical document, we may yet be sure that it embodies the feelings of the Jewish nation at the time when it was written. It is of little consequence whether a mother and seven brethren were actually put to death because they would not transgress what they believed to be the laws of God, or whether in dying they expressed their belief that they would be continued in a bodily existence by the Creator. For it is manifest from what we know of the Jews, that not merely one family but many would under similar circumstances have acted in the manner described by the historian, dying with the same fortitude and encouraged by the same hope. We have here a region in which there is no thought of the How—this troublesome question has not yet arisen, nor is it likely to arise. No doubt has yet been entertained regarding the power of God, nor would such a doubt be likely to receive much encouragement here.

26. But the human mind will not refrain from speculation, and this brings us to the second method in which a belief regarding a future state may be held. It may be held after a mode determined by speculations regarding the possible conditions of a future state. Such speculations may of course take every variety of form, but yet there are three well-defined classes into which they naturally group themselves:—

In the first place, we have the doctrine of an ethereal state, which may or may not be eternal;

Secondly, we have the doctrine of a bodily existence, which may or may not be eternal; and,

In the third place, we have the doctrine that a future state is inconceivable or impossible.

27. The first of these beliefs was probably held by a portion of the Egyptians, Greeks, and Romans, and by most of the Jews. It was likewise held by many amongst the eastern nations. It formed indeed one of the two ways of imagining a future state, but it was of a very vague and dreary nature; and from the passage of Homer already quoted (Art. 14), we realise the longing supposed to be felt by the inhabitants of such a place to escape into a more substantial region. Unquestionably it was not a place in which practical men like the Jews, for instance, would wish to dwell, and yet no doubt it had great attraction for minds of a visionary and ecstatic nature, who held matter to be the source of evil.

The return of the soul to its divine original, an Egyptian doctrine, the entrance into Nirvâ*n*a, proclaimed by Buddha, and the absorption into Buddha himself, proclaimed by some of his followers, are all proofs that a doctrine of this nature has peculiar fascinations for a dreamy order of minds. Nor must we analyse too rigidly the exact meaning and tendency of such doctrines, inasmuch as we cannot easily enter into the real feelings of those who propounded them, and who probably entertained conceptions which cannot adequately be expressed in words.

28. Coming now to the belief in a bodily future existence, it is remarkable that the doctrine of a trans-

migration of souls was extensively prevalent among all the nations we have named, if we except the Jews. It was believed in, as we have seen, by a large class of the Egyptians; it was introduced into Greece by Pythagoras and his followers; it is considered to have been from time immemorial a common property of the various religions of the extreme East; and it is recorded by Cæsar that the Druids believed in the same doctrine, although they confined the transmigration to human bodies.

It will perhaps surprise many of our readers to learn the extensive prevalence of such a doctrine, wondering as they must how it is possible to attach certainty to an existence which passes through the body of various men and animals—something perhaps like a draught of Lethe being administered at the moment of passage. But the antients, being unable to rise to a higher conception of a bodily future, were compelled to admit either this doctrine or one yet more absurd, namely, that the *very same body* which was laid in the tomb will once more be animated by the spirit which formerly possessed it. It does not therefore surprise us that the antients, with the exception probably of a portion of the inhabitants of Egypt, and some of the Jews, should have preferred the doctrine of transmigration; but we are exceedingly surprised that the alternative doctrine, of manifestly Egyptian parentage, should have come to be accepted by the modern nations of Europe under the garb of Christianity. We shall return again to this subject, but meanwhile let us observe that, when men first began to ask the How of a future state, the reply was something extremely vague and unsatisfy-

ing. No wonder, then, that a class of men who had not unlimited confidence in God, and who could not believe in either of the doctrines of a future state, should have lapsed into philosophical infidelity and denied altogether the possibility of a future state.

29. We have thus arrived at a stage of development in which we may imagine the next step to be one which will throw some light upon this question of How—that is, which will give, or at any rate profess to give, some information regarding the conditions of a future life. The intellect of man had attempted to obtain such knowledge for itself, but the result was a conspicuous failure; the sword was not sharp enough, nor the arm which wielded it powerful enough, to hew down the thick and seemingly impenetrable barrier which closes the avenue to the world of spirits.

'We cannot go to them,' was the unanimous wail of the antient philosophers; till some of the more hopeful of them suggested as an alternative that they might come to us. For clearly, if A and B are separated from each other by a barrier, and there yet remains good-will between them, two courses are possible, and only two, if they are to be made acquainted with each other. One or other must surmount the barrier. If A be so weak as to be unable to do so, and if at the same time it would be a matter of importance to him to become better acquainted with B, then B may be expected to surmount the barrier if it be surmountable, and exhibit himself to A.

30. As a matter of history, it appears that about the time of the birth of Christ there was an expecta-

tion, however vague, that something of this nature was about to take place. And when Christ made His appearance, and gathered round Him a little band of disciples, there can be no doubt that He claimed to be the bearer of intelligence from the world of spirits. All who accept the gospel narratives, however much they may differ from one another as to the light in which they regard His person and doctrine, will yet, we think, agree in this. The claim made by His disciples for His gospel was that it 'had brought life and immortality to light' (2 Tim. i. 10), and that Christ had by his resurrection 'abolished death.' The grounds of the claim were built upon the belief that He showed Himself after His resurrection to a body of men who had not previously believed that the Messiah Himself was to die and rise again.

His disciples in short took His resurrection for a proof that life is possible after death. Christ was believed to be the first-fruits of a system which was destined ultimately to enfold in the same glorious immortality all those of His disciples who were united to their Master by a sincere and living faith. Evidently Paul attached the utmost importance to the fact of Christ's resurrection, for he says (1 Cor. xv. 14), 'If Christ be not risen, then is our preaching vain, and your faith is also vain. Yea, and we are found false witnesses of God: because we have testified of God that he raised up Christ; whom he raised not up, if so be that the dead rise not. For if the dead rise not, then is not Christ raised: and if Christ be not raised, your faith is vain; ye are yet in your sins.'

31. Let us now try to ascertain what sort of future state was taught by Christ. In the first place, it was a bodily state—a state which could even adapt itself with some modification to the views of the Pharisees who believed in the resurrection of the body. But the modification introduced is sufficiently important. The occasion of its announcement was a disputation with the Sadducees, who attempted to perplex Christ by stating to Him the case of a woman who had been married in this life to seven brethren in succession, and then asking Him whose wife she should be in the resurrection. We are told (Matthew xxii. 29) that in reply to this question, 'Jesus answered and said unto them, Ye do err, not knowing the scriptures, nor the power of God. For in the resurrection they neither marry nor are given in marriage, but are as the angels of God in heaven.' We may gather by implication from this narrative, that the question would have puzzled the Pharisees, who had certainly not arrived at this idea of the resurrection state.

They must evidently have thought that the resurrection body was to be similar to the present one, and although they believed in the existence of angels, and their occasional appearance to human beings, they cannot have risen to the idea that it was possible for man to reach a similar state after death.

32. It may perhaps be said that many of Christ's sayings would seem to lead towards the doctrine of a resurrection of the very same material particles which are laid in the grave. To this, however, it may be replied that Christ undoubtedly wished to impress upon His hearers, who were for the most part unlearned and ignorant men, the substantial and bodily

reality of the future state, and therefore spoke in plain language without entering into scientific minutiæ, which would only have perplexed them, and diminished the impression which His words were otherwise calculated to produce. Few of His hearers would trouble themselves about the mode, nor was it until an objection was started by the learned Sadducees that Christ took occasion to develop His doctrine. In accordance with this view we see that a similar difficulty must have occurred more than once in the life of Paul, who was brought into contact with the philosophy of Greece and Rome. For in one of his Epistles [1] he asks the question,—How are the dead raised up? and with what body do they come? He then replies to the supposed objector in the following noble and beautiful language:—'There is one glory of the sun, and another glory of the moon, and another glory of the stars; for one star differeth from another star in glory. So also is the resurrection of the dead; it is sown in corruption, it is raised in incorruption: it is sown in dishonour, it is raised in glory: it is sown in weakness, it is raised in power: it is sown a natural body, it is raised a spiritual body. There is a natural body, and there is a spiritual body.'

33. In the next place we remark, that this conception of a spiritual body similar to that of the angels is accompanied in the religious system of Christ by a conviction that the present visible universe will assuredly pass away. This is expressed in both divisions of the writings acknowledged as sacred by the disciples of Christ. Thus it is said:—'Of old

[1] 1 Cor. xv. 35.

hast thou laid the foundation of the earth; and the heavens are the works of thy hands. They shall perish, but thou shalt endure; yea, all of them shall wax old like a garment: as a vesture shalt thou change them, and they shall be changed.'[1] Again, Paul tells us that 'the things which are seen are temporal, but the things which are not seen are eternal.'[2] Likewise also Peter says—'The day of the Lord will come as a thief in the night; in the which the heavens shall pass away with a great noise, and the elements shall melt with fervent heat; the earth also, and the works that are therein, shall be burned up. . . . Nevertheless we, according to his promise, look for new heavens and a new earth, wherein dwelleth righteousness.'[3] In like manner John tells us that he saw in a vision 'a great white throne, and him that sat on it, from whose face the earth and the heaven fled away; and there was found no place for them.'[4]

From all this we may conclude that the more advanced disciples of Christ supposed the resurrection body to be angelic in its nature, and similar to that which they believed Christ had himself assumed; and further, that they supposed this body would remain when the present visible universe had passed away.

34. We have already remarked that it was the object of Christ to bring the future state in a very vivid manner before His disciples, so that they might realise its substantial existence, and He has accordingly given them on the one hand exalted descriptions of the joys of heaven, and on the other awful

[1] Ps. cii. 25. [2] 2 Cor. iv. 18. [3] 2 Pet. iii. 10. [4] Rev. xx. 11.

accounts of the fate of the lost. Heaven was variously described by Him as a banqueting house, as a beautiful city, as Abraham's bosom, and, when speaking to His immediate disciples, as a place where they shall dwell together with their Master. On the other hand, it is believed that Christ's description of hell was borrowed from the valley of Hinnom, a place near Jerusalem, which formed the receptacle for every species of filth, the combustible parts of which were consumed by fire. Putrefaction, or the worm, was always busy there, and the fire was always burning, and this may have given rise to the expression: 'Where their worm dieth not, and the fire is not quenched.' There can be no doubt, we think, that such descriptions were meant to be allegorical, the intention being by forcible earthly images to convey an idea of what could not otherwise be conveyed.

35. It is well known that many varieties of opinion have been entertained regarding the person of Christ even by those who profess to be His disciples. It is not however here our object to enter into theological controversies; our treatment of this subject is at present historical, and we will therefore bring before our readers only those views regarding the person of Christ and the constitution of the invisible world, which are held by the large majority of those who call themselves Christians.

Whilst all the Christian Churches believe in one God, yet by most of them the Godhead is believed to consist of three persons, the Father, the Son, and the Holy Ghost. The first of these appears to be regarded as the Being or Essence in virtue of whom the Universe exists. Thus in reciting the Apostles'

Creed the Christian disciple says :—'I believe in God, the Father Almighty, maker of Heaven and Earth ;' and the laws of the Universe are regarded by Christian theologians as being expressions of the will acting in conformity with the character of this Being. Thus Nature (according to Whately) is the course in which the Author and Governor of all things proceeds in His works.

But the majority of Christian Churches virtually assert that there are two other Divine Persons, who work through and by the Universe. One great object of the second Person of the Trinity is held to be the manifestation of God to man, and possibly to other beings, in a manner and to an extent which could not be accomplished by finite intelligences. One great object of the third Person is to enter, as Lord and giver of life, into the souls of men, and possibly of other beings, and to dwell there in such a manner as to fit them for the position which they are destined ultimately to occupy in the universe of God.

36. In Christ it is supposed that we have an incarnation of the second Person of the Trinity, and the work which He accomplished is regarded as done not in violation of the order of things as established by God the Father, but rather in strict obedience to it. But while this is generally accepted by the Church of Christ, yet the doctrine of the submission of Christ to law has been held by some as not inconsistent with a view which regards the miraculous works of Christ as manifestations of His divine nature, so changing the order of things as to denote something wrought upon the universe rather than something wrought through it and by its means. We do not

think that this theory is borne out by the words of Christ himself. He says: 'I seek not mine own will, but the will of the Father who sent me.'[1] Again, we are told by Paul, that 'when the fulness of the time was come, God sent forth his Son, made of a woman, made under the law, to redeem them that were under the law, that they might receive the adoption of sons.'[2]

Christ also frequently represents His works as wrought by the Father, as for instance when he says: —'I do nothing of myself; but as the Father hath taught me, I speak these things.'[3] In fine, the whole genius of Christianity would appear to point towards a total submission of Christ in every respect to all the laws of the universe: for these, indeed, as we shall soon have occasion to show, form but another expression for the will of God acting in conformity with His character. To make our meaning clear, we may say that the will of man is accomplished in conformity with the laws of the universe, while on the other hand the will of God, as above defined, constitutes in itself the laws of the universe. Now it appears to us from what we find contained in the books of the Christian religion, that Christ must in this sense be regarded as similar to man; but, inasmuch as the relation of Christ to the universe is there asserted to have been different from that of any mere man, so the works of Christ are to be regarded as different from those which any mere man can accomplish.

37. The Christian system, of which we have thus briefly described the peculiarities, was soon called upon to do battle, on the one hand with the antient

[1] John v. 30. [2] Gal. iv. 4. [3] John viii. 28.

philosophies of Greece and Rome, and on the other with the semi-savage creeds of those less civilised races of man which were destined ultimately to overpower the Roman Empire. But it was chiefly when the apostolic pioneers came into contact with the acute minds of the antient philosophers that we have light struck regarding what may be termed the philosophical system of Christianity ; thus we have already remarked (Art. 32), that the nature of the glorified body is most clearly indicated to us by the Apostle Paul. As respects the more barbarous nations which afterwards embraced Christianity, *they* were not likely to puzzle themselves about the physical possibilities of a future state, nor even to contest the reality of a place of eternal physical torment. And so it happened that, when dealing with a lower class of converts, some prominent Christians in post-apostolic periods appealed more to their fears than to their hopes, bringing vividly before them awful ideas of the nature of hell ; while on the other hand, the higher class of converts, if they had not a very clear idea of heaven, were yet drawn with intense longing to a future which they were to spend in the company of Christ.

38. In the course of a few hundred years we find the whole Roman Empire converted to Christianity, while, however, in Arabia and the East it appears either to have made very little progress, or to have become corrupted into something very different from that which we read of in the New Testament. It had not become the national religion of the Arabs ; and we can well imagine that this nation, with their pretensions to be regarded as the most antient repre-

sentatives of the Semitic race, would not look kindly upon a religion which took its origin in a rival branch of the same family. We can further imagine that, with such a feeling, they would be very ready to welcome any skilfully devised religious system which should spring up amongst themselves. Such an opportunity was afforded them by Mohammed. Acknowledging in some measure the claims of Moses and of Christ, Mohammed yet claimed for himself and his religion a superiority over his rivals, flattering by this means the vanity of his own countrymen, who considered themselves the elder branch of the Semitic race. The heaven which was promised by Mohammed was altogether of a sensuous character, and well calculated to strike the imagination of his countrymen. He succeeded equally well in describing hell as a place of physical torture reserved for those who did not believe in his religion. He further commissioned his followers to propagate his tenets by the sword, so that men became converts from dread of earthly punishment, and were retained in his ranks by the success which attended his arms, and by the promise of a paradise full of earthly delights, as well as by the threat of a horrible material hell which was reserved for unbelievers. We could not possibly have a better or more graphic description of such a system than that which is given us by Byron :—

'But him the maids of paradise
Impatient to their halls invite,
And the dark Heaven of Houris' eyes
On him shall shine for ever bright ;
They come—their kerchiefs green they wave,
And welcome with a kiss the brave !

Who falls in battle 'gainst the Giaour
Is worthiest an immortal bower.
But thou, false Infidel ! shalt writhe
Beneath avenging Monkir's scythe ;
And from its torment 'scape alone
To wander round lost Eblis' throne,
And fire unquench'd, unquenchable,
Around, within, thy heart shall dwell ;
Nor ear can hear nor tongue can tell
The tortures of that inward hell ! '

The disciples of Mohammed believed in the unity of God, but it is evident that they had not a very exalted conception of His character. Their trust in Him could infuse zeal into their hearts and vigour into their arms when they went to make proselytes by the sword, but could not produce that lofty type of character which has so frequently appeared amongst the followers of Christ.

39. We have now reached in the history of our problem the period known as the dark ages, during which the spirit of scientific inquiry was well-nigh extinct. At length, however, there arrived a time when the human mind, from a variety of causes, suddenly awoke from the lethargy into which it had sunk.

When scientific thought was once more directed to the subject of immortality it was easily seen that the doctrine of the resurrection in its vulgar acceptation could not possibly be true, since a case might easily be imagined in which there might be a contention between rival claimants for the same body. We might, for instance, imagine a Christian missionary to be killed and eaten by a savage, who was afterwards killed himself. It is indeed both curious and instructive to note the reluctance with which various

sections of the Christian Church have been driven from their old erroneous conceptions on this subject; and the expedients, always grotesque, and sometimes positively loathsome, with which they have attempted to buttress up the tottering edifice. Some deem it necessary that a single material germ or organised particle of the body at death should survive until the resurrection, forgetting that under such a hypothesis it would be easy to deprive a man of the somewhat doubtful benefits of such a resurrection, by sealing him up (while yet alive) in a strong iron coffin, and by appropriate means reducing his whole physical body into an inorganic mass. Boston, again, in his *Fourfold State*, goes still further, adopting the idea that a single particle of insensible perspiration which has escaped from a man during his life, will be sufficient to serve as a nucleus for the resurrection body. So that according to the disciples of this school, the resurrection will be preceded by a gigantic manufacture of shoddy, the effete and loathsome rags of what was once the body being worked up along with a large quantity of new material into a glorious and immortal garment, to form the clothing of a being who is to live for ever! Unquestionably we have continuity in this hypothesis, but it is the continuity of the Irishman's coat in the story, the owner of which always made a point of retaining as many as possible of the rags which were present on the last occasion, those only which had absolutely fallen to pieces being replaced by something new! We have only to compare this grotesquely hideous conception with the noble and beautiful language of Paul, to recognise the depth of abasement into which the

Church had sunk through the materialistic conceptions of the Dark Ages.

40. But it is needless to say that this offer of a certain class of theologians to surrender everything except a single shred of the worn-out body, liberal as it may appear, was nevertheless at once rejected by the school of scientific men. Death, they replied, must be regarded as a total and complete destruction of the visible body, so far at least as the individual life is concerned. At the same time professing themselves unable to conceive such an existence as a disembodied spirit, they were forced to conclude like Priestley,[1] that the soul is not in its nature immortal. At this point, however, the scientific school splits up into two or even three sections, one believing with Priestley and others that immortality is a fresh and miraculous gift conferred upon man at the resurrection; another, unable to conceive the possibility of a miracle in the case of each individual, denying a future state altogether; while a third section maintains that there is no use in discussing the subject, because man after death has passed beyond the sphere of human inquiry.

41. Regarding the existence and nature of the Deity, various opinions have been entertained by the disciples of what we may term the extreme school of science. Some have maintained that we have no evidence of the existence of any such Being, others that we have no evidence of His personality, while others argue that although we may become convinced of His great power and wisdom from the works of creation, there are other attributes of His

[1] See Professor Huxley's Birmingham Lecture.

character which are not so revealed. We cannot, for instance, say they, maintain the benevolence of the Deity in the way in which we understand the word benevolence, nor have we any evidence that He is just in the way in which we understand the word justice. It is well known that the late John Stuart Mill would have regarded the claims of Christianity with more favour had its character been more Manichæan, that is to say, had the spirit of evil been allowed a position more nearly equal to that of the spirit of good in the government of the universe.

42. Let us here pause to indicate two points of similarity between the scientific school and the system of Christianity. Both, we conceive, maintain in some sense the supremacy of law or the invariability of the procedure adopted by the Deity in the government of the universe (Art. 36); both maintain likewise that the outer works of the visible universe are insufficient to manifest certain attributes of the Deity. Here, however, the likeness ends; the scientific school conceive they have no information beyond the visible universe, while the Christian system asserts the existence of an invisible order of things, and the fact of communications having taken place between the two for the double purpose of revealing God to man, and of raising man towards God.

43. Leaving now the views of those who may be said to constitute the extreme left, let us shortly consider the various opinions held regarding a future state by those who, though often differing widely from one another, yet rank themselves within the pale of Christianity.

Not a few who revere the sacred writings, believe

nevertheless that the descriptions of the unseen world contained therein are purely allegorical. These do not believe in the existence of evil spirits exercising an influence over the mind of man. Satan is regarded by them as a personification of evil (*Διαβόλος*, the accuser, Devil's advocate) rather than as possessing a real objective existence. The worst half of the unseen world having thus been got rid of, the other half follows in due course. Such men do not believe in the unseen presence of angels (*ἄγγελος*, messenger); in fine they conceive that there is nothing above man but the Deity, and that He always acts according to rigid law. It is an immediate step from this to believe in the futility of prayer, which is looked upon as necessarily devoid of any objective influence, although the practice of it may be regarded as possessing a beneficial subjective effect. A future life is believed to be conceivable, but only under conditions and in a universe about which we know and can know nothing. At this point, however, the views of what may be called the left centre come into contact with those of the extreme left.

44. But there are others quite disposed to believe in the existence of the unseen world, who yet regard as figurative a large part of the Biblical descriptions. Some, like the Church of Rome, consider the separation of the souls of men after death into two categories, and only two, as insufficient and unsupported by the spirit of Scripture; while others cannot admit the eternity of misery, but believe that the most reprobate will ultimately be reclaimed and elevated into the regions of bliss.

Others again, arguing from some expressions in the

Bible, regard immortality as a boon reserved for the good alone, believing that the wicked will be annihilated, both soul and body, in hell. No doubt by an energetic nature such a fate would be regarded as even worse than endless misery:

> Sad cure! for who would lose,
> Though full of pain, this intellectual being?
> Those thoughts that wander through eternity
> To perish rather, swallowed up and lost
> In the wide womb of uncreated night,
> Devoid of sense and motion.

So speaks Milton, putting the idea into the mouth of Belial, the fallen spirit, when addressing his peers.

45. Such are a few of the ways in which the statements of Christ and his Apostles regarding immortality have been interpreted by those who call themselves Christians. But amid this great diversity there is yet one principle common to all. It is imagined that something peculiar in the history of the world took place at the coming of Christ, which has not since been repeated. Communications were then made to mankind which are regarded as unique, and the truth of which it is held will only be verified in the case of each individual when he has passed into that country from which we receive no travellers' tales.

Notwithstanding this general belief, not a few have arisen pretending to have received a new and supplementary revelation. In most of these cases the scientific historian may at once come to a conclusion without any violation of his impartiality,—they are so manifestly the products of delusion if not of imposture. There is however one system which merits fuller treatment, inasmuch as it has led to a

mode of viewing the spiritual world which has many followers even at the present day.

46. Emanuel Swedenborg, the apostle of this system, was in many respects a remarkable man. Living more than a century ago, and during the time when Science was pausing for the spring she has since made, he seems to have foreshadowed, if he did not anticipate, many of the doctrines now current. We are not however now concerned with his purely physical speculations.

Swedenborg has written at great length regarding the nature and destiny of man, and the constitution of the unseen world into which he asserts he had the power of entering.

He assumes the existence of a human or semi-human race before Adam, of which he remarks that they lived as beasts. 'Man,' he tells us, 'considered in himself, is nothing but a beast. . . . Man's peculiarity over animals—a peculiarity they neither have nor can have—consists in the presence of the Lord in his will and understanding. It is in consequence of this conjunction with the Lord that man lives after death; and although he should exist like a beast, caring for nothing but himself and his relations, yet the Lord's mercy is so great, being Divine and Infinite, that He never leaves him, but continually breathes into him His own life, whereby he is enabled to recognise what is good and evil and true and false.'

Regarding man's mortal nature we are told by Swedenborg that 'man at birth puts on the grosser substances of nature, his body consisting of such. These grosser substances by death he puts off, but

retains the purer substances of nature, which are next to those that are spiritual. These purer substances serve thereafter as his body, the continent and expression of his mind.'[1]

'A man at death,' he tells us again, 'escapes from his material body as from a rent or worn-out vesture, carrying with him every member, faculty, and function complete, with not one wanting, yet the corpse is as heavy as when he dwelt therein.'

Regarding the spiritual world, he tells us 'that the whole natural world corresponds to the spiritual world collectively and in every part; for the natural world exists and subsists from the spiritual world, just as an effect does from its cause.' He also tells us 'that if in the spiritual world two desire intensely to see each other, that desire at once brings about a meeting. When any angel goes from one place to another, whether it is in his own city, or in the courts, or the gardens, or to others out of his own city, he arrives sooner or later, just as he is ardent or indifferent, the way itself being shortened or lengthened in proportion. . . . Change of place being only change of state, it is evident that approximations in the spiritual world arise from similitudes of mind and removals from dissimilitudes; and thus spaces are merely signs of inner differences. . . . From that cause alone the hells are altogether separated from the heavens.'

Of God he says: 'The Divine is incomprehensible even by the angels, for there is no ratio between the finite and the infinite.

'No man or angel can ever approach the Father

[1] *Life and Writings of Swedenborg* by William White.

and immediately worship Him; for He is invisible, and being invisible can neither be thought of nor loved.'

Of God's Providence he says: 'As in the Lord we are and act, His Providence is over us from birth to death, and even to eternity. . . . To talk of the Lord's Providence as universal, and to separate it from particulars, is like talking of a whole in which there are no parts, or of something in which there is nothing. Consequently it is most false, a mere picture of the imagination, and downright stupidity, to say that the Lord's Providence is universal, and not at the same time in the minutest particulars; for to provide and rule in the universal, and not at the same time in the minutest particulars, is not to rule at all.'

Swedenborg likewise believed in an intermediate state analogous to purgatory, although he objected to the name. This was called by him the world of spirits, after staying in which, for a longer or shorter time, the souls of the departed were drafted off to heaven on the one side, and to hell on the other.

47. We have now said enough to give our readers some idea of Swedenborg's spiritual system. Unquestionably it is the system of a profound thinker, and many great men have not hesitated to express their admiration of Swedenborg and his works. It is one thing however to admit the beauty, the philosophical completeness, and even the possible truth of many of his statements, and another thing to believe that he actually conversed with the inhabitants of another world in the way in which one man converses with another.

But, after all, suppose that the everyday experience

of men is that only he who lives in the world as not of the world lives a true life, and this is the Bible teaching,—whose then is the true doctrine? Swedenborg errs if he claims this as his *exclusive personal* experience. Paul claimed it as belonging to all men. Surely men of science should of all men claim this likewise.

Now, when a man unquestionably honest makes an assertion such as Swedenborg made, there are only two possible conclusions to which we can come, unless we choose to remain in a state of mental suspense. We must either believe that he really saw what he professes to have seen, or that he was the victim of some strange hallucination, in virtue of which his subjective impressions became transferred into the realms of objective realities. We know very well that the human mind is extremely prone to such delusions, and that the nature of the case is frequently betrayed by some indiscreet admission which we have external grounds for believing to be incorrect. Had Swedenborg confined himself to the invisible world it would have been very difficult to prove him the subject of a delusion, but when he converses with angels from the planets, and thus comes to describe their inhabitants, he enters at once upon dangerous ground.

Concerning his description of the various planets it has been remarked that his information relates only to those, the existence of which was known when he wrote, Uranus and Neptune being passed over. This of itself is a suspicious circumstance. Again, he peoples the planets Jupiter and Saturn with inhabitants as well as our own Moon; now, scientific analogy is strongly against either of these two planets

being inhabited, while it is next to certain that our moon is entirely without inhabitants.

In fine, there is no reason to suppose that the speculations of Swedenborg were anything else than the product of his own mind, in the same sense as that in which the speculations of this volume may be regarded as the product of the minds of its authors.

48. Before concluding this historical sketch let us say a few words about modern spiritualists in so far as their pretensions have reference to our subject. They assert the presence among them of the spirits of the departed, assuming sometimes a visible shape, and they compare these appearances to those which are recorded in the Sacred writings. But there is this prominent distinction between the two: the spiritual communications recorded in the Scriptures are represented as made to those who were unprepared to receive them, and also for the most part as taking place in open daylight, or, to speak more properly, having no sort of reference to light or darkness. Whatever be their explanation they have an open-air look about them. On the other hand, the manifestations recorded by the spiritualists take place as a rule in insufficient light, if not in total darkness, and in presence of those who are in a state of mental excitement.

Now, for our own part, we should not be disposed to credit any communication from the world of spirits that was not made openly, and to those unprepared to receive it, and therefore unprejudiced.

The man of science must be perfectly recipient, but he must in the interests of truth guard himself against the possibility of delusion. We know the

almost infinite power of the mind not only to delude itself, but to propagate its delusions to other minds, and, as we have already remarked, the conditions of these manifestations are specially favourable to the spread of such delusions. We do not therefore hesitate to choose between the two alternative explanations, and to regard these pretended manifestations as having no objective reality.

49. But while we altogether deny the reality of these appearances, we think it likely that the spiritualists have enlarged our knowledge of the power which one mind has of influencing another, and this is in itself a valuable subject of inquiry. We agree too in the position assumed by Swedenborg, and by the spiritualists, according to which they look upon the invisible world not as something absolutely distinct from the visible universe, and absolutely unconnected with it, as is frequently thought to be the case, but rather as a universe which has some bond of union with the present.

This line of argument will be developed in the following chapters of our book.

CHAPTER II.

POSITION TAKEN BY THE AUTHORS—PHYSICAL AXIOMS.

'Through faith we understand that the worlds were framed by the word of God; so that things which are seen were not made of things which do appear.'—HEBREWS XI. 3.

50. IN the preceding chapter we have given a very brief epitome of the various beliefs regarding immortality and the invisible world held by the civilised nations of the earth, from the earliest dawn of history to the present day. Our object has been not so much to enter even into general details as to present boldly those particular features of each system of belief which are most closely concerned with the subject of our work. Thus our account of each separate system is intentionally incomplete, even as a simple sketch. It is now time to say something about the object of this book, as well as to define the position from which we mean to start in pursuance of that object. We shall therefore commence by dividing those who at all concern themselves about our theme into three great classes.

First, we have those who are so absolutely certain of the truth of their views of religion, and of the immortality which they believe it teaches, that they are not

qualified to entertain or even to perceive any scientific objection. They acknowledge that certain deductions made by men of science appear to contradict or to be incompatible with certain truths of their religion. But these they regard as premature conclusions, averring that when the laws of nature have been more deeply investigated, there will be found a perfect concord between science and revelation. Certain scientific truths they readily assent to, and it is only the altogether human superstructure of speculation built upon these that they profess to question. 'You have built,' they say, 'upon the rock of truth a structure of wood, hay, stubble, and you would persuade us that it is the very temple of God. We will not enter it, but will patiently wait in the expectation of seeing it speedily consumed with fire.'

Now, whatever be the merits or demerits of such men, it is not for them we write. Their merit may consist in having made a perfectly true charge against certain classes of scientific men—their demerit probably in having themselves treated religion precisely as they accuse their adversaries of having treated scientific truth. We must let them alone—they will not be influenced by anything that we can say. We may perhaps be praised by them in a certain measure if it be thought that we have helped to overthrow the superstructure built by their adversaries; we shall certainly be condemned by them if it be thought that we have helped to weaken any portion of the superstructure which they themselves have reared.

51. In the next place, and occupying a middle position, we have those who see strong grounds for believing in a future life for man and in the existence

of an invisible world, but who at the same time are forced to acknowledge the strength of the objections urged against these doctrines by certain men of science. Some of this class attach much weight to the evidence in favour of these doctrines derived from the Christian records ; others again, unable to believe in these records, are yet powerfully impressed by the universal longing for immortality which civilised man has always shown, while others attach nearly equal importance to both kinds of evidence. Nevertheless, all of the class of which we now speak have deeply studied the scientific objections, and do not well see how to surmount them. It is to this class that we shall especially address ourselves in the following chapters.

52. The third class of men are those of the extreme materialistic school. All human history, including the life of Christ and that which took place in connection with it, all yearnings of man for immortality, all life, from that of the noblest of human beings to that of the primordial animated germ, are explained by this class as the result of the interaction of material atoms guided by certain measurable physical forces. They consider that they have no reason to believe that there is anything beyond or beside the visible universe, and in consequence they decline entering into any argument upon the subject. Their premiss may be wrong, but their conclusion follows from it as a matter of course. We have examined (say they) all the evidence in favour of another universe, and find it utterly worthless, why then should we discuss the subject ?—it is one of those delusions that are common in man. When a traveller pretends

to have received information about some strange and distant country, our first step is to inquire whether he is a trustworthy and sane man, and if we find he is otherwise, it is quite unnecessary for us to discuss either the information which he brings, or the objections to that information. You pretend to show the scientific possibility that this information may be correct, but why should we study your argument since there is no evidence for supposing that there is any such place?

53. To these men we would reply that, even assuming their own point of view, our scheme will, we venture to suggest, be found to give a more complete and continuous explanation of the visible order of things than one which proceeds upon the assumption that there is nothing else. In this respect we may liken it to the hypothesis of atoms, or that of an ethereal medium, for neither of which have we the direct evidence of our senses, but which have nevertheless been adopted as affording the best explanations of the phenomena of the visible universe.

54. Our readers being thus classed will now be anxious to learn our position. Let us begin by stating at once that we assume, as absolutely self-evident, the existence of a Deity who is the Creator and Upholder of all things. (Romans i. 19-21.)

We further look upon the laws of the universe as those laws according to which the beings in the universe are conditioned by the Governor thereof, as regards time, place, and sensation.

It is for instance on account of these laws that we cannot be present in different places at the same time; or move over more than a certain space in a

certain time, or think more than a certain number of thoughts; or feel more than a certain number of sensations in a certain given time.

And hence while we can very easily imagine an intelligence superior to ourselves, but yet finite, to be very differently conditioned, we cannot imagine any finite intelligence to be absolutely without conditions. At any rate, if finite intelligences unconditioned with respect to time and space be conceivable existences, they must of necessity be so absolutely unconnected with the present universe, which has reference to time and space, that their existence need not be contemplated so far at least as our argument is concerned.

55. It will thus be seen that we cannot conceive of finite intelligences existing in the universe without some sort of embodiment; but we now come to a point which deserves a somewhat fuller discussion. We can imagine the materialists saying to us: 'You are right in asserting the inconceivability of such intelligence as that of man existing without some sort of embodiment, or to speak plainly, without some association with matter—that is precisely the view we ourselves take. But, on the other hand, *we* can very well conceive of matter existing without intelligence, as for instance a block of wood, or a bar of iron.[1]' Thus the connection between these two things, matter and mind, is of such a nature, that mind cannot exist

[1] We are aware that a certain class of thinkers regard all matter and combinations of matter as in some unexplained sense alive. We will discuss this doctrine in another place; meanwhile it must be understood that we do not here allude to this peculiar life, which from its very conception must exist as truly in a dead body as in a living one; what we are discussing at present is individual consciousness of the ordinary recognised type.

without matter, while matter can and does exist without mind. Is there not therefore a reality about matter which there is not about mind?[1] Can we conceive a single particle of matter to go out of the universe for six or eight hours and then to return to it; but do we not every day see our consciousness disappearing in the case of deep sleep, or in a swoon, and then returning to us again? Far be it from us to deny that we have something which is called consciousness, and is utterly distinct from matter and the properties of matter, as these are regarded in Physics. But may not the connection between the two be of this nature?—When a certain number of material particles consisting of phosphorus, carbon, oxygen, hydrogen, nitrogen, and perhaps some other elements, are, in consequence of the operations of their mutual forces, in certain positions with respect to each other, and in certain states of motion, consciousness is the result, but whenever this relative state is brought to an end, there is also an end of consciousness and the sense of individual existence, while however the particles of phosphorus, carbon, etc., remain as truly as ever.'

56. Now this means that matter must be looked upon as mistress of the house, and consciousness as an occasional visitor whom she permits to partake of her hospitality, turning him out of doors whenever the larder is empty. It is worth while to investigate the process of thought which gives rise to this curious conception of the economy of the universe.

[1] As will be seen in Chap. III., the more important half of the realities of the physical world are forms of Energy, *which cannot exist* except when associated with Matter. We mention this merely in a footnote now, as we do not wish to diverge too far from our present line of argument.

It is clear that certain arrangements are made in the universe, in virtue of which corresponding sensations are produced simultaneously in different individuals, while in other arrangements the sensations produced are the peculiar property of some one individual. The one set have come to be associated with objective realities, while the other set are concerned with subjective impressions. I am affected by a pain in my head, and I am also affected by the sun, but the one affection is the peculiar product of my brain, and I carry it about with me, while experience has shown me that I cannot appropriate the other; yet it also becomes mine so soon as it has reached my brain.

It will further be allowed, that there are certain material particles which may become vehicles for either or both of these kinds of sensations, while there are others which have the power of producing one only. Gold, silver, and platinum are substances which may become the vehicle of common impressions, but not of peculiar impressions, since they do not occur in our brains. Phosphorus, on the other hand, is a substance which may become the vehicle of either kind. When we burn a piece of phosphorus in a lecture-room it is the vehicle of a common impression, while the phosphorus in our brain is the vehicle of a peculiar impression. Now there is a very noteworthy difference between portions of phosphorus playing these two parts. When phosphorus is in the common state, we can experiment upon it and investigate its properties, but this we cannot do when it exists in the brain in its peculiar state. The assertion, therefore, that phosphorus and its allied particles,

whose motions and positions are accompanied by individual consciousness, are nevertheless, when in this state, essentially the same as they are in the ordinary state, appears to us to be altogether without foundation. We have no right thus to argue from the one state to the other. For that most peculiar and interesting condition of phosphorus and other matter in which it is intimately connected with the production of individual consciousness, and where some peculiarity of properties or behaviour due to this connection might most warrantably be expected, is the very thing which we cannot investigate. To say therefore that the living brain consists of particles of phosphorus, carbon, etc., *such as we know them in the common state,* and that when the particles of the brain have, in consequence of the operation of physical forces, a certain position and motion, then individual consciousness follows, is to assign a peculiar relation between the brain-particles and such consciousness for which we have no scientific warrant.

57. Allied to this assumption there is another in the materialistic argument as we have stated it. If in the body there be no other material than the visible particles, and in the brain no other material than a certain quantity of phosphorus and other things, such as we know them in the common state, and if individual consciousness depends upon the structural presence of these substances in the body and brain, then when this structure falls to pieces there are of course reasonable grounds for supposing that such consciousness has entirely ceased. But it is the object of this volume to exhibit various scientific reasons for believing that there is something beyond

that which we call the visible universe; and that individual consciousness is in some mysterious manner related to, or dependent upon, the interaction of the seen and unseen.

58. There remains yet that part of the argument which hints that individual consciousness is less permanent than matter, inasmuch as such consciousness frequently departs from the universe for six or eight hours and then returns to it again. In one sense this is unquestionably true, while, however, there is a potential or latent consciousness or possibility of consciousness that remains behind.[1] It will be seen in the sequel that this fact of latent consciousness will be used by us to strengthen our argument in favour of a future state.

59. We may conclude, as the result of this discussion, that the connection between mind and matter is a very intimate one, although we are in profound ignorance as to its exact nature.

The intimacy of this connection is a doctrine almost universally held by modern physiologists. Just as no single action of the body takes place without the waste of some muscular tissue, so, it is believed, no thought takes place without some waste of the brain. Nay, physiologists go even further, and assert that each specific thought denotes some specific waste of brain matter, so that there is some mysterious and obscure connection between the nature of the thought and the nature of the waste which it occasions. In like manner memory is looked upon as dependent

[1] A very striking analogy to this will be found in Chapter III., where it is shown that energy of visible motion often disappears by transformation into the dormant or latent energy of position.

upon traces, left behind in the brain, of the state in which it was when the sensation remembered took place. Thus Professor Huxley in his Belfast address (1874) tell us: 'It is not to be doubted that those motions which give rise to sensation leave on the brain changes of its substance which answer to what Haller called "*vestigia rerum*," and to what that great thinker David Hartley termed "Vibratiuncules." The sensation which has passed away leaves behind molecules of the brain competent to its reproduction—"sensigenous molecules," so to speak—which constitute the physical foundation of memory.'

60. It will be inferred from what we have said that one of the essential requisites of continued existence of the individual is the capability of retaining some sort of hold upon the past: and, inasmuch as we are unable to contemplate such a thing as a finite disembodied spirit, it is further evident that this hold implies an organ of some sort. This we conceive to be a perfectly general proposition. We do not limit ourselves in making it to any particular arrangement of bodily form, or to any particular rank of finite organised intelligence. From the archangel to the brute we conceive that something analogous to an organ of memory must be possessed by each. This is, in fact, merely a corollary to what has been stated in Art. 54 above, and does not require any further discussion.

'61. But if one general requisite of independent and responsible life be a connection with the past, another is the possibility of action in the present. A living being must have in his frame the capacity of varied movement. He must possess a bodily organi-

sation in which there is the power of calling internal forces into play at irregular intervals dependent on his will. We cannot imagine life to be associated with a motionless mass or with a mass which moves in an invariable manner.

The living being need not always be in motion, but he must retain the capacity of moving. He need not always be thinking, but he must retain the capacity of thought. He need not always be conscious, but he must retain the capacity of consciousness.

To sum up—it thus appears that there are two general conditions of organised life. There must in the first place be an organ connecting the individual with the past, and in the next place there must be such a frame and such a universe that he has the power of varied action in the present. We particularly request our readers to keep well in mind these two propositions, since it is upon them that our argument will ultimately in great part be built.

62. We come now to a very important part of our inquiry. It will be necessary to discuss that which we term the *Principle of Continuity*, and desirable to begin by defining exactly what is meant by us when these words are used.[1] Let us introduce our definition by one or two illustrative examples.

Take a particular problem of astronomy, for instance, and, beginning at the very commencement, let us suppose an early Egyptian or Chaldean astronomer to be observing the sun in the middle of summer. Day after day, for perhaps a week, he has noticed that this luminary rises over a certain place

[1] See Essay on this subject by the Hon. Sir W. R. Grove, in his book on *The Correlation of Physical Forces.*

and sets over a certain other place, and he conceives that he has now obtained some definite information regarding the sun. His idea is, that the sun will go on always doing the same thing, and he therefore predicts to his fellows, who are less observant than himself, exactly where it will rise and where it will set. They join him in observing the luminary for a week or more, and the sagacity of our primeval astronomer is triumphantly vindicated: the sun is found doing as nearly as possible that which had been predicted of it.

63. These men have now got hold of the idea that the sun will always rise and set at the same places, that in fact his daily journey is always the same, and that he performs it in the same time. But in the course of six months they suspect they are mistaken. Discredit is thrown upon the sagacity of our astronomer, and he broods over his disgrace for six months longer. At the end of this time, on turning his eyes towards the sun, what is his surprise and delight to find that luminary doing the very thing that he had all along predicted, returning once more to his old points of rising and setting,—places, we may presume, which could be easily remembered on account of some peculiarity of landscape. He is not yet prepared however for a higher generalisation, but again calls for his fellows, and while he suspects a certain amount of irregularity in the sun, yet succeeds in convincing them that his guess was after all not far from the truth. Once again he is reinstated in their good opinion.

64. However, six months after, precisely the same thing recurs once more; the rising and setting points

are now considerably different from those predicted. Our astronomer again loses credit, and regains it only partially six months afterwards, when the points are once more right. But he has now learned a lesson. He perceives a method in all this, and ultimately rises, by means of the difficulty, to a higher generalisation. He sees that the rising and setting points of the sun go through the complete series of their changes of position in about 365 days; and he has thus learned, in a rude way, that the sun has two motions, one of which he accomplishes in 24 hours, or one day, while the other has a period of 365 days, or one year.

65. While these things are in progress, a portentous and wholly unexpected event takes place: the sun for four minutes is totally extinguished. Our astronomer meditates much on this strange phenomenon, and is inclined to regard it as a triumph of the powers of Darkness, in personal conflict with those of Light. Nevertheless he does not neglect to keep a record of the precise day on which it took place.

66. Years pass away, and our astronomer has passed away with them—he and all his generation; but a regular record is now kept of celestial occurrences, and especially of eclipses. At length it comes to be perceived that there is a periodicity even in such untoward phenomena, and an attempt is ultimately made, by means of this knowledge, to predict when the next eclipse will take place. It is perfectly successful, and the event loses from thenceforth much of its portentous significance.

67. Centuries roll on, and the apparent motions of the heavenly bodies have now been gradually reduced

to system. The stars in particular are found to move, just as if they were attached to the roof of a great hollow vault which revolves round the earth once in twenty-four hours. But even amongst them there are five exceptions—namely, Mercury, Venus, Mars, Jupiter, and Saturn—which perform a sort of wandering or zigzag motion in the midst of their stationary brethren, and have in consequence received the name of planets. All, however, are supposed to move round the earth, which forms the centre of the universe.

68. In process of time, this superiority of the earth over the heavenly bodies comes to be questioned. There is a rising tendency to regard our earth as a somewhat insignificant member of a great system, rather than as something apart by itself. These tendencies are, however, strongly opposed by the authorities of a large section of the Christian Church, on the ground that the language employed in the Jewish Scriptures is against such a method of regarding the universe. Nevertheless the Copernican system ultimately prevails, and the planets and the earth are associated together as stars which travel round the sun; while the diurnal motion of the heavenly bodies is attributed to a motion of the earth round its axis. And we cannot help thinking that philosophers of the present day are too much disposed to undervalue the absolutely enormous stride that was made when the Copernican system was fully established.

69. But the planets are still supposed to move in perfect circles round the sun; for besides the fact that this hypothesis agrees very well with observation, there is a simplicity in the circle which leads philo-

sophers to believe that nature would adopt it in preference to any more complicated curve. Has it not been found that all apparent deviation from simplicity was in reality due to the fact that our point of view is a movable one, and does not this lead us to believe that the truth will be found in a circular orbit?

70. While such speculations are indulged in, Tycho Brahe is busy with his instruments. He is a thoroughly accurate man of science, and makes most excellent observations of the various planets. These are ultimately discussed by Kepler, who finds that the planets do not move round the sun in circles, but in ellipses, having the sun in one focus. He finds too that any one planet describes areas which are proportional to the times of description; while the squares of the periodic times of the various planets are proportional to the cubes of their mean distances from the sun. These are Kepler's laws; they are yet, however, only empirical. We know them to be true, but we cannot tell why they should be as they are and not otherwise.

71. It was reserved for the genius of Newton to show us why the planets should obey these laws, and to reduce the planetary system under the domain of ordinary mechanics. He succeeded in showing that every mass of matter attracts every other mass with a force which is directly proportional to the product of the masses, and inversely proportional to the square of the distance, and that this universal force accounts, not only for Kepler's laws of planetary motion but, for the orbit of the moon, as well as for that of a projectile discharged near the surface of the earth.

72. If we now pause for a moment, and review the progress of this investigation, we shall see that it began with a disposition to regard simplicity of motion as the test of truth, and when the Copernican system showed that our point of view is a movable one, it was at first thought that this would explain all departures from absolute simplicity. But Tycho Brahe and Kepler soon showed that the planets do not move in circles, and we now know that their motions, as well as that of the moon, can only be represented by curves of extreme complexity. Simplicity of motion has disappeared, but it has been replaced by simplicity of inter-relation between the various members of the system which are supposed to attract each other according to a simple and definite law. This law may be supposed to contain in itself implicitly all the various and complicated motions of the solar system. If applied to the past it will enable us to ascertain the exact date of the ancient historical eclipses; if applied to the future it will enable us to foretell all but catastrophic astronomical occurrences.

73. Let us now turn to another branch of the same subject. When Galileo first applied his telescope to the sun, he discovered the existence of sun spots. Their solar origin was however for some time disputed, the schoolmen of that day, holding resolutely to the dicta of Aristotle, being indisposed to believe that there could possibly be any imperfection in the sun. The telescope alone was in fault. There was even a sermon preached on Galileo, the text of which was 'Viri Galilæi, quid statis in coelum spectantes?'

However, as time went on, observation showed

that spots were unmistakably solar phenomena, and these very imperfections are made use of by modern science to obtain for us information regarding the chemical and physical structure of our luminary. It also appears that the position and size of these spots depend upon the positions of the planets Mercury and Venus, and this as well as other phenomena indicate the existence of some mysterious bond between the sun and the various members of his system, possibly other than the law of gravitation, as we now understand it, can express.[1] In fine, simplicity of relation threatens to disappear, just as simplicity of motion disappeared before it.

74. Nevertheless in this triumphal march the progress has always been from the less to the more perfect, from the glimmering of early dawn to the clear morning light, if not to the bright beams of the noon-day sun. Temporary obstacles have appeared only to be surmounted, and like Augustine's ladder to constitute a platform from which a higher and more comprehensive view might be obtained. Difficulties too, other than physical,—struggles, weariness, opposition—have been encountered and overcome, nor has there been anything like a grave defeat, or the production of permanent confusion. The concluding words of the *Te Deum* have been abundantly fulfilled in the experience of the astronomer. He has trusted in God, and he has never been confounded.

75. Here then we have an instance of what is meant by Continuity. It does not imply an easy progress, or a smooth level road; it is consistent with a

[1] See *Contributions to Solar Physics*, by De la Rue, Stewart, and Loewy.

temporary halt, perhaps not even inconsistent with a temporary break-down, or with momentary despair. We are met by difficulties of many kinds—the rock, the tangled growth, the swamp, the thick darkness, but never by the abyss. Nothing has occurred to convince us that our path has been absolutely wrong from the very commencement, and that we must altogether retrace our steps; and the same thing holds in other problems besides those of astronomy. Once we have accumulated sufficient trustworthy evidence to show us that we are in the right way, we are never afterwards irretrievably defeated.

Before proceeding further, let us here notice a peculiarity which, if it be clearly exhibited in the progress of astronomy, is yet by no means confined to that science, but appears to be characteristic of all physical knowledge.

Things are so arranged and the intellect of man is so constituted that we are led in the progress of science to recognise certain laws which appear at first sight to hold exactly, or which, in other words, have the appearance of absolute truths. As time passes on, and our instruments become more delicate, while our observations with them are multiplied, signs begin to show themselves of very slight deviations from exactitude in these laws.

Meanwhile, these approximate expressions of truth during the long ages (it may be) through which they have been believed, have taken such a hold upon the minds of men that all signs of their imperfect exactitude are at first utterly discredited. Ultimately, however, it is by means of these slight discrepancies that we are led forward to higher gen-

eralisations. This was well pointed out by Sir J. Herschel in his *Discourse on the Study of Natural Philosophy*. In fine, does not something analogous to the principle of continuity prevent us from supposing that we can ever arrive at the ultimate expression of truth on any, however limited, subject? Whenever, therefore, the language in which any scientific truth is embodied appears to us to savour too much of the absolute, is it not a proper and hopeful task to endeavour to break this down? It is on this account that we welcome all attempts to modify the expression of the law of gravitation, which, as our knowledge of it stands at present, seems to present too much of the appearance of an absolute and final truth.[1]

76. Our readers will now perhaps wish to have an example of what we should term a breach of Continuity,—this is easily given. Let us suppose for instance that the sun, moon, and stars were to move about in strange and fantastic orbits during one day, after which they returned to their previous courses. Here we should have an excellent example of a breach of Continuity, for even if things were so arranged as to prevent physical disaster, it is evident that the whole intelligent universe would be plunged into irretrievable mental confusion. Never again could it be said that astronomy is competent to explain the varied motions of the heavenly bodies. The observers would lay down their instruments, and the mathematicians their calculations, and the science would come to an end.

[1] In Chap. IV. the reader will see that the only attempt to explain the mechanism of gravitation, which can be called even *hopeful*, does not give *rigorously* the law of the inverse square of the distance.

Other examples of a breach of Continuity may be as easily imagined. Suppose for instance that the gold of the world were to disappear for six hours and then return to it again,—should we not have all the social relations of men as well as their conceptions of matter thrown into irretrievable confusion? This would not, however, be due to the mere fact that something had disappeared from the visible universe Individual consciousness we have seen is seemingly in the habit of doing so and again reappearing, and we do not trouble ourselves much about it.

Continuity, in fine, does not preclude the occurrence of strange, abrupt, unforeseen events in the history of the universe, but only of such events as must finally and for ever put to confusion the intelligent beings who regard them.

77. It thus appears that, assuming the existence of a Supreme Governor of the universe, the principle of Continuity may be said to be the definite expression in words of our trust that He will not put us to permanent intellectual confusion, and we can easily conceive similar expressions of trust with reference to the other faculties of man. Our subject may therefore be approached from other points of view, and other arguments may be used founded on the principle that of two or more alternatives that one is to be selected which puts our faculties to the least confusion. But it is dangerous to speculate much further upon such subjects; the path is so easy, like the 'pleasant, green lane' spoken of by Ignorance in the *Pilgrim's Progress*, that it cannot but soon lead us into certain hopeless realms.[1]

[1] 'I hope all will be well. And, as for the gate you talk of, all the

78. Let us now endeavour to apply this principle to a preliminary discussion of the miraculous events which are alleged to have taken place in connection with the life of Christ. We may certainly begin by assuming that had these events been ordinary ones no doubt would have been entertained regarding their actual occurrence; it is not, however, our province to discuss the historical evidence in favour of Christianity.

Now, until of late years, the divines who have asserted the actual occurrence of these events have attached to this assertion a hypothesis of their own, representing the events in question as due to absolute interferences of the Divine Governor with his usual physical procedure. Each was thus supposed to represent in its physical aspect something which could not possibly be deduced from that which went before or that which followed after.

It was not exactly asserted that they were arbitrary events, or that they were not the results of purpose, but only that the purpose of which they were the accomplishment could not be carried out without some physical break. In fine, with the view of removing spiritual confusion, intellectual confusion was introduced, as being the lesser evil of the two. Thus, if he submits to be guided by such interpreters, each intelligent being will for ever continue to be baffled in any attempt to explain these phenomena, because they are said to have no physical relation

world knows that it is a great way off our country. I cannot think that any man in all our parts doth so much as know the way to it; nor need they matter whether they do or no, since we have, as you see, a fine, pleasant, green lane, that comes down from our country, the next way into the way.'

to anything that went before or that followed after. In fine, they are made to form a universe within a universe, a portion cut off by an insurmountable barrier from the domain of scientific inquiry.

79. It is not enough to say that we cannot see any foundation for this hypothesis introduced by theologians regarding these events. It is certainly necessary to add, as we have already done (Art. 36), that such a method of regarding them is essentially opposed to the genius of Christianity. Whatever may be thought of the person of Christ, it cannot for a moment be said that He was above law. He speaks of himself, and is spoken of by the apostles, as bound in all respects by the laws of the universe. Nor will it suffice to say that He obeyed the moral and spiritual, but broke occasionally the physical, laws of the universe, or had them broken for Him. In fine, we conceive that the New Testament plainly asserts that what Christ accomplished was not in defiance of law, but in fulfilment of it; and that His ability to do so much was simply due to the fact that His position with reference to the universe was different from that of any other man.

80. Of late years, however, a vastly better method of explanation has been introduced. Charles Babbage, the designer of the well-known calculating engine, showed (in a very remarkable book which he called a ninth Bridgewater treatise) that it would be possible to design and construct a machine which, after having worked for a long time according to a particular method of procedure, should suddenly manifest a single breach in its method, and then resume and for ever afterwards keep to its original law. He argued

from this that an apparent breach in the physical procedure of the universe is quite consistent with the fundamental idea of law. Jevons also, commenting upon these speculations of Babbage, remarks thus in his *Principles of Science* (vol. ii. p. 438), 'If such occurrences can be designed and foreseen by a human artist, it is surely within the capacity of the Divine artist to provide for similar changes of law in the mechanism of the atom, or the construction of the heavens.'

81. While we think that this is a very distinct and important advance upon the old idea, we venture to pronounce it altogether incomplete without some further explanation and modification.

The power of the Divine Being is surely unlimited, but, nevertheless, we have perfect trust that God, whom we believe to have given us intelligence, will work in such a way as not to put us to permanent intellectual confusion. Yet even on this hypothesis, and with this trust, a single apparent exception to the usual procedure may be supposed to occur, if it be allowed that this may be made use of in order to deduce from it the great general law of working which includes both the usual course and the apparent exception. But it appears obvious to us that if the exception be of such a nature that it must for ever confound all the intelligences of the universe who regard it, then we gain nothing by the supposition that it was allowed for in the secret counsels of God.

82. Undoubtedly we cannot permit certain events to be set aside by merely human authority as questions into which it is deemed irreligious, unprofitable, or useless for our reason to pry; nay, we are tempted

to advance even further than this, and to assert that it constitutes our duty as well as our privilege to do our best to grasp the meaning of all events which come before us. Does not the material upon which the intellect of man is intended to work include all occurrences, of whatever nature, upon earth—that earth which man is commanded to subdue—a command equivalent to victory?

83. We have now indicated with sufficient clearness the fault we have to find with the theological position as it stood until recently,—let us next briefly allude to the position of the extreme school of science. Ignoring all but the visible universe, and applying the principle of Continuity to its phenomena, the members of this school were indubitably led to most important generalisations regarding the method of working of that great system. They even drove back with much success, and very properly, certain detachments of theologians who had occupied portions of the field in an unwarrantable manner. So far the Genius whom they had summoned up appeared to be the very principle of order. But things wore a different complexion as time went on. It was fancied that historical Christianity must disappear, and that the belief in the reality of a future state must follow after it. They were surrendered. But it was extremely startling when the Genius invoked, not content with what he had already devoured, broadly hinted that the whole visible universe would furnish an acceptable sacrifice,—*then* even the most extreme partisans of the school began at length to be alarmed. It was too much to be borne, that a Genius summoned up in the very name of order

should turn out to be a demon so insatiate as this! Must the whole visible universe, indeed, arrive at such a state as to be totally unfit for the habitation of living beings? The individual they were content to sacrifice, perhaps even the race, but they would spare the universe. Undoubtedly, if it be possible to pity men who could so easily dispense with Christianity and immortality, they had at length got themselves into a deplorable dilemma. For the principle they had invoked was absolutely without pity, and in the most heartless manner continued to point towards the sacrifice of the visible universe. This, they were told, was only a huge fire, and must ultimately burn itself out. Nothing would be left but the ashes,—the dead and worthless body of the present system.

84. No wonder, then, that these men should be startled at their conclusion, and try somehow to evade it. Such an attempt was actually made, and a gleam of lurid light seemed for a moment to illuminate the thick darkness conjured up by the hypothesis. It was conjectured that the visible universe might in reality be infinite, even if the number of stars be not so, and that such a universe might last from eternity to eternity, and if it might not be supposed that such a system could continuously and without interruption afford a habitation for animated beings, yet it might do so discontinuously and by fits and starts, its available energy being recruited by repeated collisions, extending in a series from eternity to eternity. The life of whole systems, perhaps even of whole galaxies, would thus disappear, to be replaced after myriads of ages by the feeble beginnings of an entirely new order of things.

Such a hypothesis no doubt contemplates a ceaseless change, and satisfies so far the requirements of energy. But while the structures built are perishable, the stones out of which they are built—the atoms—are supposed to be eternal. It is this eternity of the atom which vitiates the hypothesis, for we shall show in the sequel that this is a doctrine which can only be held by ignoring the fundamental principles of scientific inquiry. Indeed we can hardly escape from the conclusion that the visible universe must in matter, as well as in transformable energy, come to an end. But the principle of Continuity upon which all such arguments are based still demanding a continuance of the universe, we are forced to believe that there is something beyond that which is visible, or that, to use the words of an old writer (which we have inscribed on our title-page),—'the things which are seen are temporal, but the things which are not seen are eternal.'

85. Looking back instead of forward—to the origin of this visible universe, rather than to its end, we are brought even more definitely to a similar conclusion. It is perfectly certain, as we shall afterwards see, that the visible universe must have had a beginning in time; but if it be all that exists, then the first abrupt manifestation of it is as truly a break of continuity as its final overthrow.

It may sound strange to some of our readers to be told that it is the duty of the man of science to push back the Great First Cause in time as far as possible; nevertheless, this accurately represents the part in the universe which he is called upon to play.

We dig into the crust of the earth and find therein

stratified deposits containing fossil forms, and we may either suppose that God created these as they are, or that they came into their place through the operation of natural forces, and represent the relics of an antient world of life; the latter of these is undoubtedly the scientific hypothesis. The only other hypothesis is that of certain writers belonging to the Church of Rome, who asserted that the devil put the fossils there.

Or, again, we may suppose that God created the sun, placed the earth and the other planets in their present orbits, and gave them the requisite velocities, all at once, or that the solar system gradually condensed into its present state from a chaotic mass of nebulous material; certainly, again, the latter is the scientific hypothesis.

In like manner, if we can suppose any material phenomenon, any conditioned order of things, antecedent to the appearance of the visible universe, we have gained a step. In fact, we conceive it to be the duty of the man of science to treat the original production of the visible universe just in the same way as he would any other phenomenon. It is no doubt a very large thing, but we must not be terrified at mere bigness,—we must mete out the same scientific measure to all events, whether they be great or small. We therefore welcome a hypothesis like that of Sir W. Thomson,[1] which regards the primordial atoms of the visible universe as vortices somehow produced in a pre-existing perfect fluid, provided that such a hypothesis is otherwise tenable.

86. Let not any of our readers regard this process

[1] This is discussed in Chapter IV. below.

as an attempt to drive the Creator out of the field altogether, for this is most assuredly not the case. Is it less reverent to regard the universe as an illimitable avenue which leads up to God, than to look upon it as a limited area bounded by an impenetrable wall, which, if we could only pierce it, would admit us at once into the presence of the Eternal?

In fine, we do not hesitate to assert that the visible universe cannot comprehend the whole works of God, because it had its beginning in time, and will also come to an end. Perhaps, indeed, it forms only an infinitesimal portion of that stupendous whole which is alone entitled to be called THE UNIVERSE.

87. We thus see that the extreme scientific school, as well as the old theological school, have erred in their conclusions, because they have neither of them loyally followed the principle of Continuity. The theologians, regarding matter and its laws with contempt, have without scruple assumed that frequent invasions of these laws could be consistent with a tenable hypothesis. On the other hand, the extreme scientific school, when they were brought by the principle of Continuity into such a position that their next logical step should have been the realisation of the unseen, failed to take it, and have suffered grievously in consequence.

88. It remains now, before concluding this chapter, to sketch briefly the application of the principle of Continuity to the problem we have in hand.

There are three conceivable suppositions with reference to individual existence after death. It may be regarded as the result of a transference from one grade of being to another in the present visible uni-

verse; or secondly, of a transference from the visible universe to some other order of things intimately connected with it; or lastly, we may conceive it to represent the result of a transference from the present visible universe to an order of things entirely unconnected with it.

89. This last hypothesis may however be very speedily disposed of if we are to maintain the principle of Continuity. We have seen that one of the requisites for conscious individual existence is an organ connecting the individual with the past. Now, were we to suppose a transference of living beings from the present visible universe to an order of things otherwise entirely unconnected with it, this would be a manifest breach of the law of Continuity. Imagine the utter confusion into which this present universe would be plunged, if a set of inhabitants were transferred into it having organs connecting them with a past existence in an entirely different universe. A confusion precisely similar would be occasioned by carrying out a transfer according to the hypothesis in question; so that we are able at once to reduce our suppositions to two: the first involving a transference from one grade to another of the visible universe, and the second a transference from the visible universe to some other order of things intimately connected with it.

90. In what precedes, we have argued by anticipation that the present visible universe will become effete; but in the following chapters it will be necessary to maintain this assertion by a minute examination of those laws which represent the course of things observed in the present universe. In other words,

we must settle the fitness or unfitness of the present visible universe before we proceed to discuss our second hypothesis.

91. But whether the transfer be supposed to take place in the visible universe, or from it to another intimately connected with it, the subject in either case is certainly one on which we may legitimately employ our reasoning faculties. So far indeed is the subject from being one which it will be utterly and for ever useless to discuss, that it has become our duty as well as our privilege to make the attempt, in the perfect trust that time will inevitably bring truth with it. We think that this fact has been too much overlooked by those whom we may term the moderate school of scientific thinkers. Not denying the possibility of a future state, they have yet shrunk from all attempts to investigate its conditions. We are in hopes that a perusal of this volume will lead these writers to see that the subject is one which may be profitably discussed.

CHAPTER III.

THE PRESENT PHYSICAL UNIVERSE.

. . . οἱ οὐρανοὶ ῥοιζηδὸν παρελεύσονται, στοιχεῖα δὲ καυσούμενα λυθήσονται, καὶ γῆ καὶ τὰ ἐν αὐτῇ ἔργα κατακαήσεται.—Πετρού Β'. γ'.

'The cloud-capp'd towers, the gorgeous palaces,
The solemn temples, the great globe itself,
Yea, all which it inherit, shall dissolve;
And, like this insubstantial pageant, faded,
Leave not a rack behind.'—SHAKESPEARE, *Tempest.*

'All worldly shapes shall melt in gloom,
The sun himself must die
Before this mortal shall assume
His immortality.'—CAMPBELL.

92. HAVING in the last chapter briefly indicated the nature of the proposition which we intend to bring forward, we must next study, as a preliminary to further discussion, what science tells us about the present physical universe: what are the general laws to which it is now subject; when and what must have been its beginning; when and what will be its inevitable end.

We have been driven into becoming accustomed to the phrase, 'the material universe,' which is gene-

rally used in a sense absolutely identical with that which we have chosen as the title of this chapter. We shall soon see that the term is a very inapt one, inasmuch as matter is (though it may sound paradoxical to say so) the less important half of the material of the physical universe.

In the present chapter we shall still further restrict ourselves by omitting, as far as possible, any reference to life (even in its lowest aspect), and we likewise defer to a future chapter our account of the more reasonable speculations which have been advanced with regard to the intimate structure of matter and ether.

93. It is only within the last thirty or forty years that there has gradually dawned upon the minds of scientific men the conviction that there is something besides matter or stuff in the physical universe, something which has at least as much claim as matter to recognition as an objective reality, though, of course, far less directly obvious to our senses as such, and therefore much later in being detected. So long as men spoke of light, heat, electricity, etc., as imponderables, they merely avoided or put aside the difficulty.

When they attempted to rank them as matter,—heat, for instance, as caloric,—they at once fell into errors, from which a closer scrutiny of experimental results would assuredly have saved them. The idea of *substance* or *stuff* as necessary to objective existence very naturally arises from ordinary observations on matter; and as there could be little doubt of the physical reality of heat, light, etc., these were in early times at once set down as matter. Fire, in fact (including, it is to be presumed, everything which

involved either heat or flame, real or apparent), was in early times one of the four so-called *elements*.

In those days the sun was supposed to be only a great fire; a lightning-flash, an aurora, or a comet, was merely a flame; in other words, the essence of all these was the element fire, or, as it was later called, caloric. The sun, except when he appeared as the spreader of pestilence, was the beneficent fire, as were also some of the planets; the lightning, the comet, even the moon and Saturn, were baleful fires.

This endeavour to assign a substantive existence to every phenomenon is, of course, perfectly natural; but on that very account excessively likely to be wrong.

Humanum est errare comes with quite as much heart-felt conviction of its truth from the lips of the honest Pagan as from those of the Christian believer; though perhaps its meaning may be considerably less extended in the former than in the latter case.

94. But, before discussing what is that *something else* besides stuff which has an *objective* though not a *substantive* existence, let us in the first place inquire into the grounds of our belief, that matter itself has a real existence external to us; that, in fact, the so-called evidence of our senses is not a mere delusion.

There is a strong temptation to be metaphysical here, but we will endeavour to resist it.

Now physical science furnishes us with the following among many other arguments in proof of the reality of the external universe:—

Experience of the most varied kind consistently shows us that we cannot produce or destroy even the smallest quantity of matter.

Exercise our greatest powers of imagination, do

with it what we please, we cannot make our senses indicate to us an increase or diminution in a given quantity of what we call matter. We find it so far amenable to our control that we can alter its arrangement, form, density, state of aggregation, temperature, etc.; nay, by so approximating it to other matter as to produce a chemical combination, we may entirely transform its appearance and properties,—*all but one:* its mass or quantity is completely beyond our control. Measure it by what process we please, by the 'muscular sense,' by weight, anyhow, there it is, altogether independent of us, laughing our efforts to scorn! Can this be a mere mental idea which the mind that conceived it (or, at all events, in some way received the conception of it) is unable to destroy?

But there is one other argument on this point which must be mentioned. Not only do our own senses invariably indicate to us the impossibility of altering the quantity of matter, but the senses of all men alike point to the same quantity, quality, and collocation of matter in the earth and external to the earth. Whence this extraordinary agreement between the evidences of the senses in different men, when the minds are so different?

Our conviction then of the objective reality of matter (at least from the point of view of the Natural Philosopher) is based upon the experimental truth that we can neither increase nor diminish its quantity, in fact on what we may conveniently for our present purpose call the *Conservation of Matter.*

95. Here let us pause for a moment to compare together this view of matter and the definition of the laws of the universe, which we have already given.

The laws of the universe we defined (Art. 54) to be the laws according to which the beings in the universe are trammelled by the Governor thereof as regards time, space, and sensation. Now, it may be asked, is this definition consistent with a belief in the objective reality of matter? Our reply is, that to our minds the two are in perfect accordance.

We do not here intend to enter into any metaphysical discussion. It is enough for us to say that our practical working certainty of the reality of matter depends upon the facts, *firstly*, that it offers resistance to our imagination and our will, and, *secondly*, that in particular it offers *absolute* resistance to all attempts to change its quantity. We shall soon see that experiment teaches us that both properties belong to something else.

96. Returning from this digression let us therefore assume that the objective reality of the external universe has been proved, and that this reality is strongly impressed upon us in virtue of that principle which we have called the conservation of matter.

But as soon as we grant this, we are obliged by our reason, however little our senses may incline us to it, or rather however much they may dispose us against it, to allow objective reality to whatever else may be found to be *in the same sense* conserved. (We have here italicised these four words for a reason which will afterwards appear.) This is a question which deserves and must secure careful consideration.

97. In abstract dynamics several things are said and mathematically proved by deductions from experiment to be conserved, but one only or these in the strict sense in which we have spoken of the con-

servation of matter. We will examine them briefly, and our non-mathematical readers must pardon us if we make use of certain technical expressions belonging to the domain of mathematical physics.

[It is absolutely essential that the reader should have clear notions on these points, for there is widespread confusion and error as to the meaning even of so simple and elementary a term as '*force*.' He will often find it used indifferently in either of two senses which have no connection whatever with one another; and unless he completely gets over this abuse of language he need not hope to be able to follow the present portion of our preliminary argument. Force proper is a pull, push, weight, pressure, etc., and can be measured, in the vernacular of engineers, as equivalent to so many pounds weight; but the unjustifiable use of the word applies it to *work done by a force*, so many pounds raised so many feet, *i.e. force overcome through a space*. Two such things are of different kinds, and cannot possibly be compared together. They differ in fact in precisely the same way as length or breadth differs from superficial area, *i.e.* as a linear foot differs from a square foot! And the modern abuse of the word is more outrageous, alike to science and to common sense, than would be the attempt to assign the height of a mountain in acres! For the absurdity does not end even here. We have, as yet, absolutely no proof whatever that force proper has objective existence. In all probability there is no such *thing* as force (which is suggested to us by the impressions of our *muscular* sense), any more than there is such a *thing* as Sound, or Light, which are mere names for physical impressions produced

upon special nerves by the energy of undulatory motions of certain media. The term, however, is a very convenient one for the rate of transference or transformation of energy per unit of length in a given direction.]

(1.) *Conservation of Momentum.*—What is understood by this is a mere direct consequence of Newton's *first* interpretation of his Third Law of Motion, viz., that *Action and Reaction are equal and opposite.* In this *first* interpretation Newton tells us to consider actions and reactions as forces proper, or (their equivalents) quantities of motion. This is the term employed by Newton; but we now designate it *momentum*, and measure it by the product of the mass and the velocity of a body. Stated in its simplest form, this law asserts that the momentum of a system of bodies, measured in any direction whatever, is not altered by their mutual action, whether that action be of the nature of traction, attraction, repulsion, or impact. And we see at once from this third law of motion that it must be so, because the change of momentum, in any direction, of any one part of the system, per unit of time, is the measure of the force acting on that part in that direction. Whatever momentum in this particular direction is gained by one member of the system must have been lost by other members, but not from their whole momentum, merely from the part of it in this direction. It thus appears that the (algebraic) sum of the momenta generated by the mutual actions of the system is zero.

These momenta are in fact *directed magnitudes* (like the forces of which they are the measure), and are therefore capable of *cancelling one another* when

their numerical amounts are equal and their directions are opposite. In this sense the conservation is of the same nature as that of the imagined electric or magnetic fluids, where no portion whatever of one kind can be produced without the simultaneous appearance of an equal quantity of the other, a quantity just capable of neutralising it. This is obviously not in any sense analogous to the Conservation of Matter of which we have just spoken.

As an illustration take a loaded cannon. Before firing, neither cannon nor ball had momentum. After firing, the ball has a certain momentum, the cannon (in virtue of its recoil) an *equal* and opposite momentum. If we could exactly reverse the motions of the cannon and ball just as they separate, the impact between them would just reduce each to rest, and no momentum would be left. Considered separately after the discharge, each has momentum, but *in the complete system* of cannon and ball there is no momentum—there being equal quantities of positive and negative, in the same line. In fact momentum cannot be produced or destroyed *in any system as a whole.* This is the Conservation referred to. It is as if a man always when he received a sum of money fell to the same amount in debt—the state of his affairs, as shown by his books, would of course not be altered.

(2.) *Conservation of Moment of Momentum.*—Here we deal with quantities of the order of the moments of forces about an axis, *i.e. couples* in Poinsot's sense. These also are directed magnitudes depending for their conservation upon the first interpretation of Newton's third law, and therefore the same remarks apply to them as to the preceding.

(3.) *Conservation of Vis Viva.*—*Vis viva* is the old name for energy of motion or the consequent power of doing work. We now deal with quantities which cannot possess direction, because they are essentially *products of pairs of quantities similarly directed*, and are therefore all to be treated as of the same algebraic sign, or rather (to adopt the language of Sir W. R. Hamilton) as signless quantities. With such there can of course be no cancelling.

To make our meaning clear, let us consider upon what *vis viva* depends. It depends upon and is proportional to the product of the mass into the *square* of the velocity. Compare, or rather contrast, this with the definition of momentum given above, and it will be seen that *vis viva* is the product of the momentum and the velocity. Now mass is of course a signless quantity; evidently we cannot have negative mass. Then with regard to the square of the velocity, this will be positive whether the velocity be positive or negative, whether it be in one direction or the opposite. *Vis viva*, therefore, or energy of motion, is something which is not affected with the sign of direction, or, as we have already said, it is a signless quantity. It is found to be convenient to measure it as *half* the product of the moving mass into the square of its velocity. So measured, it is now called (see § 99) *kinetic energy*.

Now to our cannon again. Before firing there is no *vis viva* of either cannon or ball. After firing each has *vis viva*, but that of the ball is greater than that of the cannon in the proportion in which the cannon's mass exceeds that of the ball. And the system as a whole has *vis viva* though it has no momentum. If,

as before, we could reverse the motions of cannon and ball, then, even when they impinged, the *vis viva* would *not* be lost. As will presently be seen, it would be employed in heating both the impinging bodies.

98. We have said that the energy which a body contains—its *vis viva*—its power of doing work, is independent of the direction in which it is moving; and, further, that while the mass is the same, it is proportional to the square of the velocity. For instance, we may measure the energy of a cannon ball or of an arrow by the distance it will carry itself up against the force of gravity, represented by its own weight, when shot vertically upwards, and we find that with a double velocity it will go four times as high. Or we may point the cannon horizontally, and measure the energy of the same ball by the number of planks of oak wood which it can penetrate, and we shall find that a ball with double the velocity will penetrate nearly four times as many as one with the single velocity. All such experiments concur together in convincing us that the energy of the ball is independent of the direction in which the cannon is pointed, and is proportional to the square of the velocity, so that a double velocity will give a fourfold energy.

99. We have just now spoken about a cannon ball fired into the air against the force of gravity. Such a ball, as it mounts, will each moment lose part of its velocity, until it finally comes to a standstill, after which it will begin to descend. When it is just turning it is perfectly harmless, and if we were standing on the top of a cliff to which it had just reached, we might without danger catch it in our arms and lodge it on the cliff. Its energy has apparently disappeared.

Let us, however, see whether this is really true or not. It was fired up at us, let us say, by a foe at the bottom of the cliff, and the thought occurs to us to drop it down upon him again, which we do with great success, for he is smashed to pieces by the ball.

In truth, dynamics informs us that such a ball will again strike the ground with a velocity, and therefore with an energy precisely equal to that with which it was originally projected upwards. Now, when at the top of the cliff, if it had not the energy due to actual motion, it had nevertheless some sort of energy due to its elevated position, for it had obviously the power of doing work. A pond of still water, unless it can fall, *i.e.* unless it has what is technically called a '*head*,' is of no use in driving a water-wheel. The head, or the power of descending, gives it a store of dormant energy, which becomes active as the water gradually descends. And the same amount of work may be obtained (by means of a turbine for instance) from a small quantity of water, provided it has a great 'head,' as can be obtained (by means of an ordinary overshot or breast wheel) from water with far less head, provided it be supplied in proportionally greater quantity. *We thus recognise two forms of energy which change into one another, the one due to actual motion and the other to position; the former of these is generally called kinetic, and the latter potential energy.*

All this appears to have been clearly perceived by Newton, who gave it as a *second* interpretation of his Third Law of Motion. His statement is equivalent, in modern language, to the following:[1]—*Work done*

[1] See Thomson and Tait's *Natural Philosophy*, § 269; or Tait's *Thermodynamics*, § 91.

on any system of bodies has its equivalent in the form of work done against friction, molecular forces, or gravity, if there be no acceleration; but if there be acceleration, part of the work is expended in overcoming resistance to acceleration, and the additional kinetic energy developed is equivalent to the work so spent.

100. Thus Newton expressly tells us (though not in these words) that we are to include in the same category work done by or against a force—whether that force be due to gravity, friction, or molecular action (such as elasticity, for instance), or even to acceleration.

(*a.*) When work is done against gravity, as in lifting a mass from the ground, we have just seen that it is (as it were) stored up in the raised mass; we can recover it at any time by letting the mass descend. Thus it is that we furnish a clock with motive power sufficient to keep it going for a week in spite of friction and other resistance, by simply winding up its weights.

(*b.*) When work is done against molecular forces, we have a similar storing up, as, for instance, in drawing a bow or in winding up a watch.

(*c.*) When work is done against the inertia of a body, *i.e.* to accelerate its velocity, Newton's definitions show that the additional kinetic energy so produced is equal to the work so spent.

(*d.*) In abstract dynamics we simply consider as lost the work spent against friction. In Newton's time it was not known what became of it.

101. Leaving out, then, for the present, the fourth alternative, we see that whatever work is spent, we must, according to Newton, even in abstract dyna-

mics recognise that *it is not lost, but only transformed* into an equivalent quantity stored up for future use, either in a quiescent form (as, for instance, the potential energy of a raised weight or bent spring), or in an active form (as the kinetic energy of a moving mass). Here, then, at last, we recognise the same sort of conservation as that which we found in matter. But the statement so far is defective, as we have seen, in one particular. What becomes of work spent in overcoming friction? or what becomes of the energy of the blacksmith's hammer after it has struck the anvil? To this experiment alone can give the answer. Let us see what it has told us.

Man has been called a reasoning animal, a laughing animal, etc., according to the momentary whim or humour of the classifier; but he is perhaps still more definitely separated from all other animals when specified as *the* 'cooking animal.' Now, it has always appeared to us as something little short of marvellous that, even for the high purpose of cooking his food, or of inflicting exquisite torture on a vanquished foe, savage man should ever have hit upon the process of procuring fire by friction. Considering his condition, and comparing his opportunities and his success with those of even our greatest modern physicists, we cannot but look upon this as one of the very greatest and most notable discoveries ever made in physics. All the more notable, too, from the fact that a man like Newton, though of course aware of it, absolutely missed its significance even at the very moment when it alone was wanted to fill a serious *lacuna* in one of his grandest and most important practical generalisations.

The missing link was all but supplied by Rumford and Davy at the very end of last century. Rumford's boiling of water by the heat generated in the boring of a cannon, and Davy's melting of ice by friction *in vacuo*, were each conclusively demonstrative alike of the non-materiality of heat and of the ultimate fate of work spent in friction, which is thus seen to be converted into heat; or at least these experiments could easily have been made demonstrative by very slight additions to, or modifications of, their author's methods or reasoning. But the exact and formal enuntiation of the equivalence of heat and work required to fill the *lacuna* in Newton's statement was first given by Davy in 1812.

102. Let us here pause for a moment and contemplate the position to which the solution of our problem had even then attained. Visible kinetic energy, such as that of a cannon-ball shot upwards, is transformed as it rises into visible potential energy. As the ball descends its energy is retransformed from the potential into the kinetic variety until, when it is about to strike the earth, it has, or rather would have if there were no atmosphere, as much kinetic energy as it had when it was first shot upwards.

When the ball has once struck the earth its kinetic energy of visible motion is changed by impact into that kinetic energy of invisible motion of its particles which is called heat; and, generally speaking, in all cases of friction, percussion, and atmospheric resistance we have a change of visible energy into heat, as for instance when a railway train is stopped by the action of the brake, when a blacksmith strikes the anvil with his hammer, when a cannon-ball moves

through and heats the air, or when a meteorite or falling-star is rendered incandescent by the resistance it meets with even in the higher and rarer strata of the atmosphere.

We had thus come to the stage of regarding heat as a species of molecular energy into which visible energy is often transformed, and very soon afterwards it came to be perceived that there were other forms of molecular energy besides heat—some of these being potential and some kinetic. Thus two substances may possess mutual chemical affinity when separated from each other, just as a raised stone tends to fall again to the earth, and we obtain a form of potential energy in the one case as truly as in the other. When, for instance, we have carbon or coal in our cellars or our mines, and oxygen in the air, we are in possession of a store of chemical potential energy upon which we can draw at any moment and change it during the process of combustion from the potential to the kinetic form. Again, in a current of electricity we have no doubt a species of kinetic energy, although it still puzzles men of science to say what form of invisible motion such a current implies. From all this, without being further perplexed with scientific details, our readers will perceive that there are many different forms, some of them potential, and others of them kinetic, in which energy may appear.

While we were thus grasping the fact that energy can appear under various forms, we were also beginning to perceive that it had great powers of transmutation—going about from one form to another, and Sir W. R. Grove did good work at this stage of the inquiry in bringing together the various cases of such

transmutations in his work on the Correlation of the Physical Forces.

In spite of this, it was left for Joule and Colding, who worked almost simultaneously and by well-devised experimental methods from about the year 1840, independently to discover, and by degrees to enuntiate, by means of arguments founded on *the only admissible basis—experiment*, the grand law of the *Conservation of Energy*. In its most general form, the statement of the conservation of energy is merely a completed version of the passage we have already quoted from Newton; and the experimental discoveries of Rumford and Davy, extended and completed by Joule and Colding, allow us now to put Newton's second or alternative interpretation of his *Third Law of Motion* into the modern statement of the *Conservation of Energy*.

In any system of bodies whatever, to which no energy is communicated by external bodies, and which parts with no energy to external bodies, the sum of the various potential and kinetic energies remains for ever unaltered.

In other words, while the one form of energy becomes changed into the other,—potential into kinetic and kinetic into potential, or one species of either into another;—yet each change represents at once a creation of one kind of energy and a simultaneous and equal annihilation of another, the total energy present, as we have already said, remaining for ever unaltered.

103. Taking as our 'system of bodies' the whole physical universe, we now see that, according to the test we have already laid down, energy has as much

claim to be regarded as an objective reality as matter itself. But the forms of statement are most markedly different for the two. We before spoke of the quantity of matter without qualification, but we now speak of *the sum of the two kinds* of energy. Let us think for a moment of this, and we see that whereas (to our present knowledge, at least) matter is always, the same, though it may be masked in various combinations, energy is constantly changing the form in which it presents itself. The one is like the eternal, unchangeable Fate or *Necessitas* of the antients; the other is Proteus himself in the variety and rapidity of its transformations.

> Φύσις, διαδόχαις σχημάτων τρισμυριόις,
> ἀλλάσσεται τύπωμα, Πρωτέως δίκην,
> πάντων ὅσ' ἔστι ποικιλώτατον τέρας·
> τῆς δ' αὖτ' Ἀνάγκης ἐστ' ἀκίνητον σθένος,
> μόνη δ' ἁπάντων ταὐτὸ διαμένουσ' ἀεὶ
> βροτῶν τε καὶ θεῶν πάντ' ἀποτρύει γένη.[1]

104. And again, *energy is of use to us solely because it is constantly being transformed.* When the sluice is shut, or the fire put out, the machinery stops; when a man cannot digest his food, he breaks down altogether. Coal in itself, except on account of an occasional fossil it may contain, or its still somewhat uncertain mode of formation, or (to take a lower

[1] Thus paraphrased for us :—

> Nature, bewildering in diversity,
> Of marvels Marvel most inscrutable,
> Like Proteus, altereth her shape and mould;
> But Fate remaineth ever immovable,
> And, changeless in persistency, outwears
> The Time of men, the gods' Eternity.

point of view) as a material for ornament, is a very useless thing indeed: its grand value consists in its chemical affinity, in virtue of which it possesses great potential energy as regards the oxygen of the air, which can very easily be transformed into its equivalent in heat. 'Keep your powder dry' is merely one way of saying 'preserve the ready transformability of your energy.' In fact, if we think for a moment over what has just been said, to the effect that the only real things in the physical universe are matter and energy, and that of these matter is simply passive, it is obvious that all the physical changes which take place, including those which are inseparably associated with the thoughts as well as the actions of living beings, are merely transformations of energy. Thus it is an inquiry of the very utmost importance as regards the present universe: *Are all forms of energy equally susceptible of transformation?* To see the importance of this question, the reader has only to reflect that if there be any one form of energy less readily or less completely transformable than the others, and if transformations constantly go on, more and more of the whole energy of the universe will inevitably sink into this lower grade as time advances. Hence the whole possibility of transformation must steadily grow less and less; in scientific language, though the *quantity* of energy remains for ever unchanged, its *availability* steadily decreases.

105. Now, every one knows a case in which there may be an unlimited amount of energy present, no part of which is available for transformation. It is the simple one of heat in a number of bodies, *when*

all are at the same temperature. To obtain work from heat we must have hotter and colder bodies, to correspond, as it were, with the boiler and condenser of a heat-engine; and just as we can get no work from still water if it be all at the same level, *i.e.* if no part of it can fall, so in like manner we can get no work from heat unless part of it can fall from a higher to a lower temperature. This is a remark of the very utmost consequence to our argument, and must therefore be fully elucidated. Unfortunately it is not as yet possible to do this without introducing a good many scientific technicalities which are unsuited to the great majority of readers. In the next eight sections we endeavour to explain it as simply as we can. The reader who cannot easily follow us may pass, without break of continuity in the argument, at once to Art. 114.

* 106. The first step in the investigation of the transformation of heat into work was taken by Sadi Carnot in 1824: a step which has recently been found of inestimable value in every branch of modern physical science. He devised a method of startling originality for the purpose of attacking this special question of the production of work from heat. His inferences from its application were not all correct; this was due however to no fault of the method, but to the fact that he unfortunately assumed (though with caution, and under a protest almost amounting to an assertion of the opposite) the materiality of heat. His method embraces two perfectly new ideas:—

(1.) That, at least with our present knowledge, no inference is possible as to the relation between heat

and work, until the heated or working substance is brought back, after a complete *Cycle* of operations, to its initial physical state.

Obvious as this statement, once made, is, it was altogether ignored (twenty years after Carnot) by Séguin and Mayer, whom some authors still persist in setting forth as the founders of the dynamical theory of heat. Their speculations were entirely vitiated by their violation of this principle.

(2.) That an engine whose cycle of operations is reversible is a perfect engine, that is to say, gives the greatest possible amount of work from a given quantity of heat with any assigned temperatures of boiler and condenser.

The term reversible is not here used in the popular sense in which a mere reversal of the direction of motion of each part is contemplated, *i.e.* what would be more properly termed 'backing,' it is used in the higher sense of taking an engine which converts a certain quantity of the heat spent on it into work, while it lets the rest down from the boiler to the condenser, and then spending upon it the same amount of work with the result of taking back the heat from the condenser, adding thereto the heat-equivalent of the work so spent, and thus restoring the whole of its original loss in heat to the boiler; simply in fact reversing all the results of the direct action.[1]

* 107. Sir W. Thomson, in 1848, was the first to recal attention to the work of Carnot, after Colding and Joule had published their experimental dis-

[1] For a more complete statement of Carnot's work see Tait, *Recent Advances in Physical Science*, 1876.

coveries ; and he pointed out that the action of the reversible engine gave what had been up to that time vainly sought, an absolute definition of temperature—a definition, that is, altogether independent of the properties of any particular species of matter. In fact it is obvious that as reversibility in the sense we have just explained is the stamp of perfection in a heat-engine, all reversible engines, whatever be the working substance, will, under the same circumstances, that is to say, *with the same temperatures of boiler and condenser,* convert the same fraction of the heat spent on them into work. This, of course, still leaves wide scope for choice of a definition of temperature : but that finally determined on by Thomson was chosen (in consequence of a hint from some experimental results of Joule) so as to make the absolute measurement agree nearly with that of the long-familiar air-thermometer. It therefore stands as follows :—

The heat taken in by a perfect engine is to the heat given out by it in the same proportion as the absolute temperature of the boiler to that of the condenser.

Of course it is hardly necessary to state that it is only the excess of the heat taken in over that given out by any engine that can have been converted into available work. This follows at once from the conservation of energy.

Experiments carried on by Joule and Thomson[1]

[1] They virtually showed that in a perfect steam-engine with pressure equal to 'one atmosphere' in its boiler, and with its condenser at the temperature of melting ice, the ratio of the heat taken in to the heat given out is 1·365 to 1. Hence if the difference between the numbers is to be 100, these must be 374, 274.—*Phil. Trans.*, 1854.

together have shown that the absolute zero of temperature is nearly 274° below zero of the centigrade scale; so that on the absolute scale the temperature of melting ice is 274°, while that of water boiling under the standard pressure is 374°.

* 108. In 1849 James Thomson made a very remarkable application of Carnot's reasoning, the first of a series of such applications which have since done immense service in the extension of almost every branch of physics. He showed in fact that, because water expands in the act of freezing, *the melting point of ice must be lowered by pressure* Sir W. Thomson in the same year verified this deduction, to its numerical details, by direct experiment. Trifling as the predicted and measured effect appears (one degree centigrade for each 2000 lbs. additional pressure per square inch), there can now be no doubt that it goes at least very far to explain the varied effects of the extraordinary plasticity of glacier-ice so beautifully made out by the direct measurements of Forbes.

* 109. We have said that Carnot unfortunately based his reasoning on the assumed materiality (and therefore indestructibility) of heat. It therefore became a question of great importance to find how properly to adapt his methods to the true theory. James Thomson's verified prediction had already given a correct and absolutely new physical result from Carnot's principles. How then must we get rid of his false assumption?

Clausius attempted this in 1850, but his method is based solely upon the observed fact that in general heat tends from hotter to colder bodies. This we know is not always the case, for a fine wire may be

made red-hot by the current from a thermo-electric battery (of a sufficient number of pairs) where ice and boiling water alone are used to cool and heat the alternate junctions. Here heat certainly passes from colder bodies to a hotter one. Clausius, no doubt, several years later, extended his original statement, so as to make it stand thus:—Heat cannot *of itself* pass from a colder to a hotter body. We do not consider even this sufficiently obvious for an axiom, were it certainly true, but, as will be seen presently, it is not. In fact the so-called axiom is constantly being violated, though on a very small scale, in every mass of gas.

* 110. It was Sir W. Thomson[1] who (in 1851) first correctly adapted Carnot's magnificently original methods to the true theory of heat; and it is especially noteworthy to remark how, even at that early time, he saw the full danger of attempting to lay down anything too definite on the subject. The following is the axiom he gives:—

'*It is impossible by means of inanimate material agency to derive mechanical effect from any portion of matter by cooling it below the temperature of the coldest of the surrounding objects.*'

But he appends the following guarded note:—

'If this axiom be denied for all temperatures, it would have to be admitted that a self-acting machine might be set to work and produce mechanical effect by cooling the sea or earth, with no limit but the total loss of heat from the earth and sea, or, in reality, from the whole material world.'

The full importance of this will appear presently.

[1] See Tait, *Phil. Mag.*, 1872, I. 338, 516; II. 240.

To those who can accept Thomson's axiom with the explanation appended to it, Carnot's proposition that a reversible engine is perfect (in the sense of being the best possible) is demonstrated at once, as follows, *ex absurdo.*

Suppose there could be an engine, M, more perfect than a reversible engine, N. Set the two to work together as a compound engine, M letting down heat from boiler to condenser, and doing work; N spending work in pumping back again the heat to the boiler. If N be made to restore to the boiler at every stroke exactly what M takes from it, the compound engine will do external work, for, by hypothesis, M is more perfect than N. Whence does the work come? Not from the boiler, for it remains as it was. Hence N must take more heat from the condenser than M gives it; *i.e.* you get work by cooling the condenser.

Carry the reasoning a little further, and we see that if the excess of work given by M were spent upon N, and thus no work on the whole either spent or given out, the condenser would be still further cooled, and the boiler heated! This, to most people, would seem to imply an ample *reductio ad absurdum.* But Clerk-Maxwell has shown it to be physically possible, and has thus thoroughly justified Thomson's caution about his axiom. As this is a point of very great importance, we offer no excuse for treating it pretty fully.

* 111. Clerk-Maxwell's reasoning is given as depending upon the molecular theory of gases, but the only necessity for so restricting it appears to be that we thereby connect the reasoning more directly with

Heat, which, on this theory, is supposed to be the energy of motion of the molecules of the gas. The illustration, however, is more general, and at the same time more simple, if we do not at first refer either to heat or to the molecular hypothesis of the constitution of gases, but treat the question simply as one concerning the possible motions of a number of little material particles.

Assume, then, that a great number of small equal spherical particles of matter are enclosed in a vessel of any form, and assume further that (either by collision or by repulsive force) each of these has the power of rebounding from another or from the wall of the vessel, as if it were elastic, and had unit *co-efficient of restitution*,[1] as defined in treatises on natural philosophy. Then it can be shown, as a matter of direct calculation, that—start these particles as we please, in all sorts of directions, and with velocities as varied as we please—after a time, which will be shorter as the number of particles is greater, a sort of permanent state will be arrived at in which a certain law of distribution of velocity prevails among the particles (the same law as that of the *Probability of Error*, as it is technically called), the greater number of them having nearly the mean square velocity, and those which have much less or more than that being fewer and fewer as the defect or excess is greater. The tendency is to an average distribution of these varieties of velocity throughout the vessel, and the impacts on the sides will thus be nearly the same on every square inch of its surface. After this

[1] Thomson and Tait's *Natural Philosophy*, § 300; or Tait and Steele's *Dynamics of a Particle*, 3d ed. § 299.

there is—*always provided the particles be sufficiently numerous*—no perceptible change in the statistics of the group, except in so far as concerns *individual* particles, which may sometimes be moving with great, sometimes with very small, velocity, but which, in the long-run, will far more often be moving with the mean square velocity, or at least some velocity very near it. Hence, in no part of the vessel will the average energy be sensibly greater than in another, and therefore (so far as the contents of the vessel alone are concerned) there is no possibility of getting work from them. But by enlisting in our service conceivable finite beings (imagined by Clerk-Maxwell, and called demons by Thomson), it would be possible materially to alter this state of things, even although these beings should do absolutely no work.

* 112. For suppose a firm partition, full of little doors (themselves without mass) to be placed so as to divide the vessel into two, and set a demon at each door, with instructions to open it for an instant whenever he sees he can thereby let a quick-moving particle escape from the first compartment to the second, or a slow-moving particle from the second into the first. Then, *because the tendency is not to a uniform distribution of velocity* among the particles, but to a distribution which involves quicker and slower in certain proportions, we may imagine this process to be carried on long enough to make a considerable difference in the average velocities of the particles in the two compartments, though the numbers of particles in each compartment may remain almost unchanged. The consequence will of course be a greater pressure per square inch on the walls

of the second compartment than of the first; and thus, if the partition wall were moveable, a certain amount of work might be obtained by allowing it to move. Thus a group of particles originally incapable, without external assistance, of doing work, may be rendered capable of doing work by mere *guidance* applied by finite intelligence.

* 113. Now let us refer for a moment to the molecular theory of gases, and we see that what the demons (without any expenditure of work, each being, so far as he is required, virtually a combination of two intelligent perfect engines, one working direct, the other reversed) have guided the gas to do, is to transfer heat from a colder to a hotter portion of the gas.

The only reason why this does not occur without the assistance of demons (at least to an extent, or for a length of time, sufficient to produce a sensible effect) lies in the enormous number of particles per cubic inch in even the most rarefied gas. Hence, *solely because of the excessive numbers and minuteness of the particles of matter*, the one chance of escape from Carnot's proposition is denied us, and therefore we must allow that, so far as the physical universe is concerned, a reversible heat-engine is the best possible.

But if a reversible heat-engine be the best possible, then the principle which we have italicised in Art. 107 must hold good, and from this it follows that only a portion of the heat passing through a perfect engine can be transformed into useful work unless the condenser of the engine be at the absolute zero of temperature—a condition which can never be attained.

114. It thus appears that at each transformation of heat-energy into work a large portion is degraded, while only a small portion is transformed into work. So that while it is very easy to change all of our mechanical or useful energy into heat, it is only possible to transform a portion of this heat-energy back again into work. After each change too the heat becomes more and more dissipated or degraded, that is, less and less available for any future transformation.

In other words, the tendency of heat is towards equalisation; heat is *par excellence* the communist of our universe, and it will no doubt ultimately bring the present system to an end. The visible universe may with perfect truth be compared to a vast heat-engine, and this is the reason why we have brought such engines so prominently before our readers. The sun is the furnace or source of high-temperature-heat of our system, just as the stars are for other systems, and the energy which is essential to our existence is derived from the heat which the sun radiates, and represents only an excessively minute portion of that heat. But while the sun thus supplies us with energy he is himself getting colder, and must ultimately, by radiation into space, part with the life-sustaining power which he at present possesses. Besides the inevitable cooling of the sun we must also suppose that owing to something analogous to ethereal friction[1] the earth and the other planets of our system will be drawn spirally nearer and nearer to the sun, and will at length be engulfed in his mass. In each case there will be, as the result of the colli-

[1] Stewart and Tait *on the Heating of a Disk by Rotation* in vacuo (*Proceedings of the Royal Society*).

sion, the conversion of visible energy into heat, and a partial and temporary restoration of the power of the sun. At length, however, this process will have come to an end, and he will be extinguished until, after long but not immeasurable ages, by means of the same ethereal friction his black mass is brought into contact with that of one or more of his nearer neighbours.

115. Not much further need we dilate on this. It is absolutely certain that life, so far as it is physical, depends essentially upon transformations of energy; it is also absolutely certain that age after age the possibility of such transformations is becoming less and less; and, so far as we yet know, the final state of the present universe must be an aggregation (into one mass) of all the matter it contains, *i.e.* the potential energy gone, and a practically useless state of kinetic energy, *i.e.* uniform temperature throughout that mass.

But the present potential energy of the solar system is so enormous, approaching in fact possibly to what in our helplessness we call infinite, that it may supply for absolutely incalculable future ages what is required for the physical existence of life. Again, the fall together, from the distance of Sirius let us say, of the sun and an equal star would at once supply the sun with at least as much energy for future radiation to possible planets as could possibly have been acquired by his own materials in their original falling together from practically infinite diffusion as a cloud of stones or dust, or a nebula; so that it is certain that, if the present physical laws remain long enough in operation, there will be (at immense intervals of time) mighty catastrophes due

to the crashing together of defunct suns—the smashing of the greater part of each into nebulous dust surrounding the remainder, which will form an intensely heated nucleus—then, possibly, the formation of a new and larger set of planets with a proportionately larger and hotter sun, a solar system on a far grander scale than the present. And so on, growing in grandeur but diminishing in number till the exhaustion of energy is complete, and after that eternal rest, so far at least as visible motion is concerned.[1]

116. The study of the necessary future has prepared us for an inquiry into the long remote past. Just as the present discrete stellar systems must finally come together, so the materials which now form them must have originally been widely separate. Our modern knowledge enables us to look back with almost certitude to the time when there was nothing but gravitating matter and its potential energy throughout the expanse of space—ready, as slight local differences of distribution predisposed it, to break up into portions, each converging to one or more nuclei of its own, and thus forming in time separate solar or stellar systems. We have thus reached the beginning as well as the end of the present visible universe, and have come to the conclusion that it began in time and will in time come to an end. Immortality is therefore impossible in such a universe.

[1] If the visible universe be imagined to be infinite, we should have (following out our line of thought) infinitely large masses separated from each other by infinite distances, appearing for infinite ages in the liquid and solid states, and thence transformed by means of infinite collisions into the gaseous condition in which they will remain for another infinite series of ages. Is there much gained by this conception?

CHAPTER IV.

MATTER AND ETHER.

'Felix qui potuit rerum cognoscere causas,
atque metus omnis et inexorabile fatum
subjecit pedibus, strepitumque Acherontis avari.'
VERGIL.

'Who shall tempt with wandering feet
The dark, unbottomed, infinite abyss,
And through the palpable obscure find out
His uncouth way; or spread his airy flight
Over the vast abrupt, ere he arrive
The happy isle?'—MILTON, *Paradise Lost.*

117. THE next portion of the preliminary inquiry necessary to our concluding argument is that which relates to the intimate nature of matter; and more especially of that very wonderful form of matter which is the vehicle of all the energy we receive from the sun, as it is that of all the information we obtain about the position, motion, nature, mass, condition, and properties of the almost infinitely more distant bodies, which are scattered through cosmical space. In other words, we have hitherto spoken only of the laws of working of the machine called the physical universe; let us now endeavour to study the structure of the materials of which it is composed.

118. Various hypotheses have been proposed as to the ultimate nature of matter. To give even a general account of all the less absurd of these would require a large volume, so we content ourselves with a few of the more reasonable or historically more important.

(1.) The foremost place must of course be taken by the old Greek notion of the *Atom*. The outlines of the atomic theory were laid down very precisely by Democritus and Leukippus (*circa* 400 B.C.), who taught that the whole universe is made up of empty space and eternal atoms, differing only in form (as A and N), order (as AN and NA), and posture (as Z and N). The atoms are endued with a primitive motion in virtue of their weight, and, clashing together, produce vortices from which the world is formed. The gradual progress of this whirl of atoms brings similar elements together, as in the sifting of grain, and so the atoms are sorted into homogeneous groups.

The great weakness of this theory lay in the very false ideas then held as to the nature of motion by weight, which was supposed to be necessarily in parallel lines, and with a velocity greater for heavy than for light bodies. The difficulty which arose from this notion led Epicurus to give to the atoms a perfectly arbitrary and capricious side movement, as well as the rectilineal motion due to their weight, and thus, in his school, the theory became really a metaphysical one, reducing the order of the universe to pure chance.

It is such a medley of physical speculations, with metaphysical notions, that we find in the greatest exponent of the system, the 'poet philosopher' Lucre-

tius. With the help of Munro's splendid edition of the text of Lucretius, and his very valuable translation and notes, it is now a comparatively easy matter to give a concise summary of the principal points of this most remarkable early physical speculation. In attempting to do so we will endeavour, so far as we can, to bear in mind the awful but too often disregarded warning given by the poet himself:—

> 'Omnia enim stolidi magis admirantur amantque,
> inversis quæ sub verbis latitantia cernunt,
> veraque constituunt quæ belle tangere possunt
> auris et lepido quæ sunt fucata sonore.'[1]

119. As the purpose of the poem of Lucretius is the establishment of the very opposite of our present theme, we must consider a good deal more of his work than the mere properties of atoms. Lucretius tells us that his object is to dispel the fear of the gods, which he supposes to arise simply from the fact that there are so many things which men do not yet understand, and therefore imagine to be effected by divine power.

Religion, which crushes human life prostrate upon earth, is, he says, now put under foot; and the great victory achieved by his Greek instructor over the immeasurable universe (in finding what can and what cannot come into being) brings us level with heaven.

His followers are not to fancy that there is any sin in this; on the contrary, religion has perpetually been the cause of sinful deeds. There is, however, danger

[1] i. 641. Thus rendered by Munro:—'For fools admire and like all things the more which they perceive to be concealed under involved language, and determine things to be true which can prettily tickle the the ears and are varnished over with finely sounding phrase.'

of their relapse, for the terror-speaking seers may once more overcome them. But if men could only be convinced that the soul is born and perishes with us, then they would be able to take their ease, and withstand alike religious scruples and threatenings of the seers. For this purpose we must find out what mind and soul consist of, and how everything on earth proceeds; and if we can do this, we may, of course, dispense with the gods.

120. FIRST, then, *nothing comes from nothing*, which seems to be meant in the sense that there is a physical cause for everything; at least all the examples which are adduced in proof of the statement are mere instances of what might be conceived to happen if there were no fixed determining physical law or cause. But the author is obscure on this point, for he sometimes makes us inclined to think that he is virtually only asserting the eternal, unchangeable, existence of the atom,—the 'first beginning of things.'

As a corollary to this, of course, *nature does not annihilate things*, but dissolves them back into their first bodies. The same negative proof is here attempted. Nothing is lost, but nature can beget nothing till she is recruited by the death of something else. Then, to reconcile the reader to the invisibility of these first bodies, he is shown how nature works by invisible things, as wind and moisture; how marriage-rings and paving-stones, ploughshares and statues, are worn away without the loss of any visible particles. Nature, therefore, works by unseen bodies. Smell, heat, cold, etc., must consist of a bodily nature, because they affect the senses; for nothing but body can touch and be touched.

121. But, SECONDLY, *there is also void in things*, else they would be jammed together, and unable to move. It is false to say that things may move in a *plenum:* as, when a fish presses on, it leaves room behind it, into which the water may stream; for on what side can the scaly creature move forwards unless the waters have first made room; and on what side can the waters give place so long as the fish cannot move? (This of course is metaphysics, and is altogether absurd. It is the old story of the immovable body receiving the irresistible blow.) Hence there cannot be motion unless there be void to allow of a start. Dripping of water in caves, the passage of food throughout the whole of the body of an animal, the fact that buds and fruit of trees are nourished from the root, voices heard through walls, cold penetrating the very bones, all are proofs that there is void as well as body. Also when one thing is as large as another, but yet lighter, there must be more void in it.

122. THIRD. *There can be no third thing besides body and void.* For if it be to the smallest extent tangible, it is body; if not, it is void.

123. FOURTH. *Bodies are either first beginnings of things* (atoms), *or a union of such.* Any thing which can be broken or crushed, or which can transmit heat or electricity, is partly body and partly void. Hence body cannot be crushed, and 'therefore first beginnings are of solid singleness, and in no other way can they have been preserved through ages during infinite time past, in order to reproduce things.'

124. FIFTH. If there be no limit to breakage, nothing could be reproduced; for reproduction is

slower than decay, and therefore the breaking of infinite past ages would have produced a state of things incompatible with the reproduction of anything within finite time. *Hence there exists a least in things.* This cannot be soft, else it would consist partly of void, and be therefore breakable.

First beginnings, then, are strong in solid singleness. Hence the unreason of those who held fire to be the matter of things, for what surer test can we have than the senses whereby to note truth and falsehood!

The doctrine called that of Homœomeria by Anaxagoras is folly,—his notion, to wit, that everything is made up of little parts the same as itself—bones of little bones, flesh of little fleshes, etc. For thus corn and other food, which go to nourish our blood, must be in part composed of blood, and must therefore bleed when crushed by the formidable force of the millstone!

125. SIXTH. *Are the atoms infinite in number, and is the void in which they move unlimited?* Both questions are answered in the affirmative, but the proof given is metaphysical and altogether ridiculous, though it contains a fragmentary passage of real merit, hinting at Le Sage's explanation (presently to be given) of the cause of gravity. One illustration of it must suffice:—'Nature keeps the sum of things from setting any limit to itself, since she compels body to be ended by void, and void in turn by body;' so that either by the alternation of the two, or by the infinite extension of one if the other do not bound it, immeasurable space must be filled. If, for instance, body were finite, and void infinite, matter would in a

very short time be scattered and borne along in the mighty void; or, rather, could never have been brought together.

This agrees with an idea which is propounded in the second book, as to the velocity which the atoms have given them (he does not say how or whence), and which enables them to cohere for a time and then to break up again, as everything wanes. Those whose close-tangled shapes hold them fast together form enduring stone and unyielding iron, others spring far off and rebound, leaving great spaces between; 'these furnish us with thin air and bright sunlight.' Shortly afterwards, we are told that the velocity of the first beginnings when passing through empty void must be greater than that of sunlight!

We need not trouble ourselves here with Lucretius's speculations as to the formation of tangible bodies from a vertical downpour of atoms, which, unlike drops of rain, now and then swerve from their courses so as to clash together, save to mention that he affirms that, even if he did not know what atoms are, he could be sure, from its defects, that the world was not made for us by divine power.

126. SEVENTH. This, one of the most important points of the whole theory, is entirely ignored by some good commentators, and by others who have more or less closely followed them:—*The first beginnings of things have different shapes, but the number of shapes is finite.*

127. EIGHTH. *The first beginnings which have a like shape, one with another, are infinite in number.*

That is, there is a finite number of kinds of atoms, but an infinite number of each kind.

128. NINTH. *Nothing whose nature is apparent to sense consists of one kind of first beginnings* (only).

129. We need not trouble ourselves with his notion of the smallness, smoothness, and roundness of the atoms which make up the mind, qualities which he arrives at from the rapidity with which the mind originates and works out a suggestion, contrasting here the mobility of water with the viscosity of honey. Nor his proof (by the non-diminution of the weight and dimensions of the body at death), that the whole mass of the mind must be exceedingly small. But we may quote, in two of its many forms, his constant reiteration of the unreasonableness of the fear of death, and his philosophic mode of overcoming it:—

'Some wear themselves to death for the sake of statues and a name. And often to such a degree, through dread of death, does hate of life and of the sight of daylight seize upon mortals, that they consider self-murder with a sorrowing heart, quite forgetting that this fear is the source of their cares (this fear which urges men to every sin), prompts this one to put all shame to rout, another to burst asunder the bonds of friendship; and, in fine, to overturn duty from its very base, since often ere now men have betrayed country and dear parents in seeking to shun the Acherusian quarters. For, even as children are flurried and dread all things in the thick darkness, thus we in the daylight fear at times things not a whit more to be dreaded than what children shudder at in the dark, and fancy sure to be. This terror, therefore, and darkness of mind must be dispelled, not by the rays of the sun and glittering shafts of day, but by the aspect and law of nature.' Book III. 78.

'Now no more shall thy house admit thee with glad welcome, nor a most virtuous wife and sweet children run to be the first to snatch kisses, and touch thy heart with silent joy. No more mayest thou be prosperous in thy doings, a safeguard to thine own. One disastrous day has taken from thee, luckless man, in luckless wise, all the many prizes of life. This do men say; but add not thereto: "And now no longer does any craving for these things beset thee withal." For if they could rightly perceive this in thought, and follow up the thought in words, they would release themselves from great distress and apprehension of mind. Thou, even as now thou art, sunk in the sleep of death, shalt continue so to be in all time to come, freed from all distressing pains; but we, with a sorrow that would not be sated, wept for thee, when close by thou didst turn to an ashen hue on thy appalling funeral pile, and no length of days shall pluck from our hearts our ever-enduring grief. This question, therefore, should be asked of this speaker, what there is in it so passing bitter, if it come in the end to sleep and rest, that any one should pine in never-ending sorrow.' Book III. 894.

130. To conclude, there is a great deal in Lucretius (whether his own or derived from others does not matter to us) which is of considerable value, even from a modern scientific point of view, though, of course, of far greater value from the point of view of the student of development. But his attempted proofs are for the most part absurd, based, as they generally are, upon mere metaphysical speculations and altogether preposterous analogies.

131. (2.) Boscovich and others endeavoured to dis-

pense with the atom altogether, substituting in its place the conception (which mathematicians often find useful) of a mere geometrical point, which is a *centre of force*, as it is called. Here we get rid of the idea of *substance* entirely, but we preserve (all but inertia) those external relations by which alone the atom is capable of making known its presence. Even so great an experimental philosopher as Faraday may be quoted as, to some extent at least, agreeing with this notion. It seems to us, however, that this is the embodiment of an over-refinement of speculation, surrounded on almost all sides by the gravest difficulties. It may suffice merely to mention again the property of mass, or inertia, which Faraday himself seemed to look upon as the *one* essential characteristic of matter, and which we can hardly bring ourselves to associate with the absence of what we understand by substance.

132. (3.) Another speculation leads us to imagine matter as not ultimately atomic—as, in fact, infinitely divisible. But, if it be so, it must (in order that various elementary physical facts may be capable of explanation) be practically continuous but intensely heterogeneous. That solid or liquid matter has a grained structure of not infinitely small dimensions is proved by many simple and generally known facts; among others by the separation of white light into its constituent colours when refracted through a prism, by the phenomena of capillarity, and by those of contact electricity. If such heterogeneity were only pronounced enough, it appears that the law of gravitation would be capable of accounting for at least the greater number of effects at present attributed to the so-called molecular forces and the force

of chemical affinity. Here, however, we are met by the grand difficulty, that of accounting for gravitation. And the only attempt at explanation of gravitation-attraction, which can be called even plausible, can only, with very great straining, be made compatible with this idea of the nature of matter.

133. (4.) The fourth and most recent speculation revives the atom (in the literal sense of the word), but not 'strong in solid singleness' like those contemplated by Lucretius,—much rather yielding to the least external force, and thus escaping from the knife or wriggling round it, so that it cannot be cut, —not, however, on account of its hardness, but on account of its mobility, which makes it impossible for the knife to get at it.

This is the vortex-atom theory of Sir W. Thomson, dimly foreshadowed in the writings of Hobbes, Malebranche, and others, but only made distinctly conceivable in very recent times by the hydrokinetic researches of Helmholtz. Helmholtz, in 1858, first successfully attacked the equations of motion of an incompressible frictionless fluid, without introducing the great simplification which had been adopted by his predecessors, and which consisted in supposing the motion to be non-rotational. He proved, among other valuable results, that those portions of the fluid which at any time possess rotation preserve it for ever, and are thus as it were marked off from the others; also that these portions must be arranged in filaments whose direction is at each point the axis of rotation, and that the filaments are either endless, *i.e.* form closed curves (whether knotted or not), or terminate in the free surface of the fluid.

Hence Sir William Thomson's idea that what we call matter may consist of the rotating portions of a perfect fluid, which continuously fills space. This definition involves the necessity of a creative act for the production or destruction of the smallest portion of matter, because rotation can only be produced or destroyed by us in a fluid in virtue of its viscosity (or internal friction), and in a perfect fluid there is nothing of the kind.

134. Of course it may be objected to this theory that it merely shifts the difficulty one step further back,—after all, explaining what we call matter by certain motions of something which, as it must have inertia, it would appear we are bound to call matter also. We have been careful to mention this (latest) speculation as to the nature of matter for three reasons: 1st, because we shall have to make considerable use of it in the course of our argument, for purposes of illustration; 2d, because it shows one way of at once thoroughly accounting for the conservation of tangible matter; 3d, because it shows the possibility of forming an idea of a true atom which shall not require, even for perfect elasticity, the inconceivable quality of perfect hardness necessary to the atom of Lucretius. In fact, the few words which we have given above about Helmholtz's investigations show that, to cut a vortex atom, it would be necessary to give a free surface to the perfect fluid which on this theory is supposed to fill space, *i.e.* virtually to sever space itself! This suggestion of Thomson's promises to be very valuable from one point of view at least, viz., the extension and improvement of mathematical methods; for in

the treatment of its very elements it requires the application of the most powerful of hitherto invented processes, and even with their aid, the mutual action of two ring-vortices (the simplest possible space-form) has not yet been investigated except in the special cases of symmetrical disposition about an axis. Hence we are at present altogether unable to decide or even to guess whether this idea will or will not pass with credit some of the most elementary examinations to which a theory of the ultimate nature of matter must of course be subjected.

135. Take them for what they are worth. The four forms of speculation we have just sketched represent the most plausible guesses yet propounded as to the ultimate nature of matter, the second being probably because the most artificial and the most arbitrary, the most completely developed. For in it the representation is self-contained as it were; it does not base itself upon extraneous postulates, as of ultimate hard particles (of what?), nor upon vortex motion (of what? again), nor, finally, upon mere intense heterogeneity (of what? once more), as do the other three. But we naturally object to it as refining away altogether the idea of *stuff* or *substance* which the mind seems to require as something underlying the notion of anything which is found to be directly capable of affecting our senses.

136. The reader who has followed us so far, must now see that our notions of the nature of matter are, at best, but hazy. We know, it is true, a great many of its properties very exactly, so much so indeed, as to be able to deduce from them mathematically an immense variety of consequences which subsequent

experiment shows to be correct, at least within the limits of accuracy of our methods of observation and measurement. But as to *what it is* we know no more than Democritus or Lucretius did, though as to what it may be or may not be we are perhaps considerably better prepared with an opinion than they could possibly be.

137. We have seen in the preceding chapter that energy is never found separate from matter, so that we might, with perfect propriety, define matter as the seat or vehicle of energy—that which is essential to the existence of the known forms of energy, without which, therefore, there could be no transformations of energy, and therefore no *life* such as we now know it.

138. The transformability of a given amount of energy, or, at least, the mode of its transformation, often depends in a very curious manner upon the relative quantity of matter with which it is associated. We have already seen this in the case of heat. For, when a given quantity of heat is associated with a small quantity of matter, it is at a high temperature, and has great availability, but its temperature, and therefore its availability, become lower as the quantity of matter with which it is associated is increased. It is possible that radiant heat and light owe their high availability to the very small density of the luminiferous ether.

But it is not of heat alone that this statement is true. The same thing holds with regard to other forms of energy, even the very simplest forms of visible kinetic energy for instance. A pillow or bolster (stuffed with eider-down, let us say) of 30 lbs.

weight, and moving at 10 feet per second—*i.e.* as if it had fallen from a height of considerably *less than two feet*,—has nearly the same energy as a pellet of No. 1 shot when it leaves the muzzle of a fowling-piece. How different the quality of these equal quantities even of energy of the same kind! For, delivered horizontally, the one would correspond to a staggering push which few men could resist if it came unexpectedly; while the other would scarcely affect one's equilibrium, though it might easily kill by penetrating a vital organ. [In the brutal pastimes of the last generation, as we now in our advanced humanitarianism call them, this was well known as the difference between the effects of a slow knock-down blow by a heavy-weight, and a 'punishing facer' from a feather-weight. Alas for the good old times! for our comparison, apt as it is, is too probably thrown away on the degenerate inhabitants of (once) merry England, erewhile the home of the 'Miller,' with his honest quarterstaff, of jolly and chivalrous wrestlers, boxers, and bowmen, now the hell of running-kicks, garrotting, gouging,[1] and stabbing.

> Aetas parentum, pejor avis, tulit
> nos nequiores, mox daturos
> progeniem vitiosiorem.

The dissipation of energy is a great fact in a moral as well as in a physical sense. In those good old times *men* fought with *men*,—irrepressible energy,

[1] This has been spoken of as an exaggeration. We hope it may be so; but when it was written (in the winter of 1874) the newspapers were full of the sickening details of the gouging of an old man by a gang of miners, who afterwards filled the sockets with quicklime! These human fiends are probably already at liberty, having had their few months of simple imprisonment!

rather than any sordid passion or uncontrolled vice, constantly pulling the trigger! *Now* creatures in the likeness of men vent their despicable passions in murderous assaults upon women and children. But science hints at an effectual cure. It is probable that before many years have passed, electricity, which by some mysterious means enables our nerves to call our muscles into play, will be called upon by an enlightened legislature to solve this desperate social problem. Imprisonment has been tried in vain, and, besides, it involves great and needless expense. The 'cat,' though thoroughly appropriate, is objected to as tending to brutalise (!) the patient, and render murder not unlikely. No such objections can be urged against the use of electricity in any of its many forms. For it can easily be applied so as to produce for the requisite time, *and for that only*, and under the direction of skilled physicists and physiologists, absolutely indescribable torture (unaccompanied by wound or even bruise), thrilling through every fibre of the frame of such miscreants.]

139. After inertia, which is not accounted for by any of the hypotheses as to the ultimate nature of matter which we have just given, the most general property of matter which we recognise is that of universal gravitation, in virtue of which portions of matter, if situated at a distance from one another, are possessed of potential energy. We are apt to hold exaggerated notions of the immense power of gravity; but a little consideration will show us that it is in reality one of the most trivial of the forces to which matter is directly or indirectly subject.

Think for a moment of the fundamental experi-

ments in electricity and magnetism, known to men for far more than 2000 years,—the lifting of light bodies in general by rubbed amber, and of iron filings by a loadstone. To produce the same effects by gravitation-attraction,—at least if the attracting body had the moderate dimensions of a hand-specimen of amber or loadstone,—we should require it to be of so dense a material as to weigh at the very least 1,000,000,000 lbs., instead of (as usual) a mere fraction of a pound. Hence it is at once obvious that the imposing nature of the force of gravity, as usually compared with other attractive forces, is due not to its superior qualitative magnitude, but to the enormous masses of the bodies which exercise it.

In fact, the excessively delicate Torsion-balance of Michell was absolutely requisite to demonstrate, much more to measure, the mutual attraction between a large and a small leaden sphere. And (unless the third of the hypotheses as to the nature of matter above given be correct, in which case the *form* of our statement would require modification) small or even moderately large pieces of matter are held together entirely by cohesion, gravitation being absolutely insensible; though in a huge mass like the earth, the force exerted by one hemisphere on the other (*i.e.* the force which would be called into play to prevent its being split in two) depends mainly upon gravitation, in comparison with whose enormous amount even a cohesive force of 500 lbs. weight per square inch over a circular surface of 4000 miles radius sinks into utter insignificance![1]

140. One only of the many hypotheses which have

[1] Tait, *Proc. R.S.E.*, 1874-5.

been advanced to explain the cause of gravitation has succeeded in passing the first preliminary tests. Of course, the assumption of action at a distance may be made to account for anything; but it is impossible (as Newton long ago pointed out in his celebrated letters to Bentley) for any one 'who has in philosophical matters a competent faculty of thinking' for a moment to admit the possibility of such action.

Hence we have but two ways of accounting for gravitation:—either it is due to differences of pressure in a substance continuously filling all space, except where matter displaces it (?), or it is due to impacts, in some respects analogous to those of the particles of a gas which have been found to be capable of accounting for gaseous pressure.

Now, all attempts as yet made to connect it with the luminiferous ether, or the medium required to explain electric and magnetic distance-action, have completely failed; so that we are apparently driven to the impact theory as the only tenable one.

141. To this theory Le Sage of Geneva devoted a singularly acute mind during the whole of his exceptionally long life; but, for all that, his posthumous tract on the subject is but little in advance of the results he had arrived at in his eighteenth year.

He assumes the existence of ultra-mundane corpuscles; in infinite numbers, even compared with those of the particles of matter; of dimensions excessively small, but flying about in all directions with velocities enormously great. Portions of gross matter virtually screen one another to a certain extent from the pressure due to this perpetual rain of corpuscles; but only on the sides turned towards one another.

Hence a lone body would be equally battered on all sides; but the introduction of a second mass interferes with this arrangement, and diminishes the pressure on the side next it. It is easy to show that the amount of this diminution, for *given small masses*, is inversely as the square of their relative distance. But when larger masses are taken account of, this diminution of pressure will not be (as gravity is) directly as the quantities of matter present, unless the further assumption is made that matter, whether by the great distance between its particles, or by the cage-like form of these particles, is almost perfectly permeable to the corpuscles; so that, practically, the corpuscles rain upon each of the interior particles of a mass as freely as if it had been alone in space.

Some of the postulates of this theory are hard to grant, and there is additional difficulty as to the mode in which the supply of energy of the corpuscles is to be kept up. To enter into details on this subject is not in accordance with our plan. We therefore refer the reader to Sir W. Thomson's account of Le Sage's theory (Proc. R.S.E., 1871), and his suggestions for its improvement, based upon his theory of vortex-atoms.[1]

142. But we must make one remark. If Le Sage's theory, or anything of a similar nature, be at all a representation of the mechanism of gravitation, a fatal blow is dealt to the notion of the tranquil form of power we have called *potential* energy. Not that there will cease to be a profound difference in kind between it and ordinary *kinetic* energy; but that

[1] See also the extremely interesting article *Atom*, by Clerk-Maxwell, in the 9th ed. of the *Encyclopædia Britannica*.

BOTH must come henceforth to be regarded as kinetic. What we now call kinetic energy is that of visible motions, also of motions of the smaller parts of bodies, and of the luminiferous ether, etc., each of these being more refined, as it were, than the preceding. But if Le Sage's theory be true, potential energy of gravitation is a kinetic form still further refined than any of these. And the conservation of energy may perhaps once more be completely and accurately expressed as the conservation of *vis viva*, though the term will of course have then a meaning incomparably more extensive than its original one.

143. But, in speculations like these, we have soared far beyond that which may be called the first refinement on ordinary gross matter; *i.e.* the luminiferous, probably also the electric and magnetic, medium, provisionally the *Ether*.

To the consideration of its principal properties we now turn our attention.

These are, at first sight at least, of an apparently incongruous character; for, from one point of view, the ether appears as a fluid, from another as an elastic solid. Nothing is more certainly established in physical astronomy than the excessive minuteness of the resistance offered by the ether to the planetary motions, if, indeed, there be such a resistance at all appretiable, even when the velocity is, as in the case of the earth, somewhere about 100,000 feet per second! On the other hand, we learn from physical optics that light, transmitted with a velocity of 188,000 miles per second, depends upon transverse disturbances of some kind or other; while several optical phenomena indicate that a disturbance of the

nature of compression (if such be possible) would be transmitted with velocity almost infinitely great, in comparison even with this enormous velocity.

144. Stokes, however, has given a very ingenious illustration which enables us to see that such an extraordinary combination of apparently irreconcilable properties is by no means without analogy, even in common matter. He takes the case of a solution of glue, or isinglass, or jelly, in different relative amounts of water. When the quantity of water is small, we have the elastic solid; when large, a liquid little different from water. And Stokes shows that it is excessively improbable that there is any definite intermediate stage which we could assign as that at which the transition from the solid to the liquid takes place. Of course, any such analogy must necessarily be excessively imperfect; but a great deal is gained by our being able to trace even a very imperfect analogy in a case like this.

145. The ether, in fact, must be distorted as well as displaced by matter passing through it; but any distortion of the nature of a shear, such as would give rise in water to vortex-motion accompanied by friction (the whole energy being thus ultimately frittered down into heat), would in the ether be handed on at once, as vibratory motion, with the velocity of light. Thus vortex-motion of the ether may be conceived to be impossible, simply in consequence of the minuteness of its density in comparison with the great tangential force called into play by a shear; and a body moving in it with a velocity not so great as that of light would thus not have eddies in its wake, as in an ordinary fluid, but, on the contrary, would be a source

of radiation, even although there may have been no heating either of the body or of the medium it is displacing, paradoxical as this result may appear. In this connection it is hardly possible to avoid quoting Milton—though there may be a suspicion of something analogous to a pun :—

> 'The griding sword with discontinuous wound
> Passed through him—but the ethereal substance closed
> Not long divisible.'

146. Sir William Thomson has endeavoured to obtain at least an inferior limit to the density of the ether in planetary space. His method is based upon the measurements by Pouillet and Herschel of the whole amount of radiant energy received from the sun by a given amount of terrestrial surface in a given time, and upon an assumption that the extreme amplitude of distortion of the ether in any radiation is small compared with the length of a wave. In this way he finds that, as a cubic mile of the ether near the earth contains about 12,000 foot-pounds of radiant solar energy, the mass of the ether in that cubic mile must be at least $\frac{1}{1,000,000,000}$ of a pound.[1] To show that this is not by any means a surprisingly small quantity he compares it with the mass of a cubic mile of air at a distance of only a few radii from the earth's surface (supposing that the atmosphere extends so far ; which, by the way, the recent calculations of the velocities of the particles of a gas render exceedingly improbable). This, he finds, will be probably represented by a fraction of a pound having unit for a

[1] Here it is important to observe that the speculations of Sir W. Thomson with regard to the density of the Ether assign only the inferior limit of that density. The *real* density may possibly be very much greater.

numerator and 329 places of figures in the denominator!!!

147. In a very remarkable paper by Struve,[1] an attempt was made to settle the question, *Is the ether perfectly transparent?* or, as we may now put it, Is any radiant energy absorbed by the ether, whether to produce other forms of energy, or to be dissipated by radiation in all directions? Long ago it had been pointed out by Olbers and others, that if the stars be infinite in number, and be distributed with anything roughly approximating to an average density through infinite space, the sky ought, night and day, to be all over of a brightness of the same order as that of the sun. Is the number of stars, then, finite; or does the ether absorb their light? Now, it need not in the least surprise us to find that the number of stars is *finite*, even though matter be infinite in quantity, and distributed with something like uniformity through infinite space. For only a finite portion of it may yet have fallen together so as to produce incandescent bodies; or, the other extreme, only a finite portion of it may be left incandescent. Either of these altogether different hypotheses is perfectly reasonable and scientifically justifiable; so that, from this point of view, we are not at present likely to obtain any information. Struve's reasoning, which, by the way, is not accepted by Sir J. Herschel, introduces another consideration, viz., *the number of stars of each visible magnitude.* To apply this: suppose for a moment we make the assumption (actually measured values of annual parallax show it is certainly at best a very rough one) that the brighter stars are the nearer, and

[1] *Études d'Astronomie Stellaire*, 1847.

that a set of stars, on the average one-fourth as bright as another set, are on the average twice as far off, etc. A great deal of what we know to be certainly false is here assumed as true, but it is possible that the general accuracy of the results of the reasoning from it may not be thereby much affected. On the supposition of a sort of rough uniformity of distribution through space, we can easily calculate approximately what ought to be the relative numbers of the stars, classed by astronomers as of the various different magnitudes, once we have obtained (as it is not difficult to do) an estimate of the relative brightness of typical stars of these (arbitrary) magnitudes. From their brightness we calculate at once their relative distances, and thence (according to our hypothesis of approximately uniform distribution) what ought to be *the relative numbers of each magnitude.* When this is done, it appears that there is a great excess of the calculated over the observed numbers, at least for telescopic stars, and the greater the smaller the magnitude. This is the gist of Struve's method, and he arrives at the result that the light of stars of the sixth magnitude (the smallest visible to an ordinary unaided eye, and whose average distance from us is supposed to be somewhere about ninefold that of stars of the first magnitude) loses about eight per cent. in its passage to the earth. Thus the light of stars of the first magnitude does not lose so much as one per cent.; but, on the other hand, stars of the ninth magnitude are enfeebled to the extent of about 30 per cent. Struve shows that, if his result is to be accepted, W. Herschel's idea that his 40-foot telescope would show him stars seven times farther off than

those visible with the 10-foot, was erroneous. He would, in fact, have been able to see little more than *twice* as far.

It will be obvious now that an enormous increase of the so-called *space-penetrating* power of a telescope gives it in reality but a very feeble additional advantage, in fact, that, if there be absorption by the ether, we have already instruments capable of showing us, at the very least, half of the whole number of stars which any conceivable improvement of telescopes would enable us to see.

148. It would be out of place here to speculate on what becomes of the light thus supposed to be absorbed, for we have as yet no experimental bases on which to reason. We have not the least idea, for instance, what is the effect of change of temperature in the luminiferous ether. That it is practically incompressible we know; it is quite probable that it may not be sensibly compressed (if it be subject to gravity, of which we have no proof) even by the attraction of the mass of the whole earth—though, so great is the intensity of molecular or cohesive attraction, we may easily conceive that in the interior of bodies the ether may be considerably compressed. And it is not improbable that the ether, as a whole, may have, in virtue of its internal forces, a property (akin, as it were, to a liquid film) such that the gravitation action, which appears to be between particles of matter, may merely be the visible result of a tendency to a minimum of some affection of the fluid in which they are immersed.

Regard the ether as we please, there can be no doubt that its properties are of a much higher order

in the arcana of nature than those of tangible matter. And as even the high-priests of science still find the latter far beyond their comprehension, except in numerous but minute and often isolated particulars, it would not become us to speculate further. It is sufficient for our purpose to know from what the ether certainly does that it is capable of vastly more than any one has yet ventured to guess.

149. If we review the attempts recorded in this chapter we see how the scientific mind is led from the visible and tangible to the invisible and intangible.

In the first place, we know that one body, such as the sun, can part with its radiant energy to another body, such as the earth, and observation and experiment alike lead us to acknowledge a stage in which the energy has left the one body and has not yet arrived at the other. But we have already seen that energy is always found associated with matter, never by itself. In fact we have spoken of matter as the 'vehicle of energy.' Hence it necessarily follows that there is something between the sun and earth capable of moving and transmitting energy, and therefore, from the very conception of energy, possessing mass—this something we agree to call the ethereal medium.

Again, we know that different masses of visible matter attract one another apparently at a distance. Our first attempt to analyse the nature of this force leads to the question:—Does it proceed from the surfaces of the attracting bodies, or does it penetrate their entire mass? This question was answered by Newton, who came to the conclusion that every particle of matter attracts every other particle with a

force proportional to the product of their masses, and inversely proportional to the square of their distances.

But this drives the mystery of gravitation only from the mass to the particle, and here the same sort of questions again occur. A particle as truly as a mass occupies space, and we wish to know whether gravitation force proceeds from the surface of the particle or from its interior.

150. We likewise wish to know how this force is communicated between one particle and another? Before we can solve these questions we must have some definite conception of the nature of a particle and of the constitution of the surrounding medium. Sir W. Thomson, as we have seen, has attempted to advance towards the nature of an atom or particle in his supposition that atoms are vortex-rings generated out of a perfect fluid filling all space. While, however, this conception accounts for some of the properties of an atom it does not at all directly account for anything like gravitation, and hence he adopts in addition the hypothesis of ultra-mundane corpuscles, which he supposes to be only a finer form of vortices.

151. There is, however, one objection to the precise form of vortex-ring hypothesis introduced by Thomson which from our point of view is very strong. The act by which the atom was produced must necessarily on this hypothesis have been an act of creation in time (Art. 133), that is to say, an act impressed upon the universe from without, and it must therefore have denoted a breach of continuity (Art. 85); for if the invisible universe be nothing but a perfect fluid, can we imagine it capable of originating such a development in virtue of its own inherent

properties, and without some external act implying a breach of continuity?—we think most assuredly not. In the production of the vortex-atom from a perfect fluid we are driven at once to the unconditioned—to the Great First Cause; it is, in fine, an act of creation and not of development. But from our point of view (Art. 86) creation belongs to eternity and development to time, and we are therefore induced to modify the hypothesis so as to make it consistent with this view. We cannot, in fact, if we agree to hold at the same time the principle of unbroken continuity and the vortex-ring theory of formation of the visible universe, regard the invisible material whose rotating parts are ordinary matter as an absolutely perfect fluid.

152. This way of regarding this supposed invisible material is strengthened by the fact that the hypothesis which seems most likely to account for gravitation presumes the existence of ultra-mundane corpuscles: and the observations of Struve upon the extinction of star-light tend (whatever they are worth) towards the same conclusion, since the absorption of light is more compatible with a corpuscular constitution than with that of a perfect fluid. Finally, the mere fact that the velocity of light is finite, tends also in the same direction. But if the visible universe be developed from an invisible material which is not a perfect fluid, then the argument deduced by Sir W. Thomson in favour of the eternity of ordinary matter disappears, since this eternity depends upon the perfect fluidity of the invisible. In fine, if we suppose the material universe to be composed of a series of vortex-rings developed from an invisible

universe which is not a perfect fluid, it will be ephemeral, just as the smoke-ring which we develop from air, or that which we develop from water, is ephemeral, the only difference being in duration, these lasting only for a few seconds, and the others it may be for billions of years.

153. In our last chapter, we came to the conclusion that the available energy of the visible universe will ultimately be appropriated by the invisible, and we may now perhaps imagine, at least as a possibility, that the separate existence of the visible universe will ultimately share the same fate, so that we shall have no huge useless inert mass existing in far remote ages to remind the passer-by of a form of energy and a species of matter which will then have become long since out of date and functionally effete. Why should not the universe bury its dead out of sight?

CHAPTER V.

DEVELOPMENT.

'Are God and Nature then at strife,
That Nature lends such evil dreams?
So careful of the type she seems,
So careless of the single life;
. . . . . .
. . . . . .
'"So careful of the type"? but no,
From scarped cliff and quarried stone
She cries, "A thousand types are gone:
I care for nothing, all shall go."'—TENNYSON.

'*All nature is but art*, unknown to thee;
All chance, direction, which thou canst not see,
All discord, harmony not understood;
All partial evil, universal good;
And spite of pride, in erring reason's spite,
One truth is clear, whatever is, is right.'—POPE.

154. IN the two preceding Chapters we have dwelt upon the laws of energy and the ultimate constitution of matter; in other words, we have discussed the laws according to which the machine called the visible universe works, as well as the probable nature of the material of which it is composed. We have in this process (Arts. 86, 151) come to the conclusion that the visible universe has been developed out of the

invisible. Once developed, it has its own laws of action which we may discover,—laws which at present appear to be invariably followed, as far at least as our strictly scientific experience can inform us.

In fine, the visible universe is that which we are in a position to observe; gaining an insight into its present method of working, and trying also to reply to the very interesting question, Has it always worked in its present manner, or has there ever been any apparent break?

Let us therefore consider this visible universe immediately after its production, and endeavour to become acquainted with the course of its development. What did it do? Was it, or was it not, entirely left to itself, and to what may be termed the natural laws impressed upon it when it was produced? Or, if the results of our inquiry seem to show that it was not entirely left to itself, when, to what extent, and for what purposes, has there been and is there interference proceeding from the unseen?

In replying to these questions, let us, for the sake of convenience, consider development under the three following heads, viz., (α) Chemical or Stuff Development, (β) Globe Development, (γ) Life Development.

155. Beginning with chemical or stuff development, we come at once to a very interesting and important question. Assuming that the atoms of the present universe were developed from the invisible, were different kinds of atoms thus developed, or were they all of one kind?

To this question the chemist of last century would have replied, that undoubtedly there were many kinds of primeval atoms, and then would follow a formidable

list of all these various substances which he was unable to decompose.

The chemist of thirty or forty years later would still have replied to the question in the same way, but he would probably have furnished a different list of primeval elements less formidable in number.

If the chemist of forty years ago had been asked, he would have furnished a list of perhaps fifty simple substances; but then, probably, the minimum would have been reached; for ask the chemist of to-day, and he will furnish a list of sixty-four so-called elements.

156. But while the number of as yet undecomposed bodies is slowly increasing by fresh discoveries, chemists are beginning to speculate as to the possibility that these so-called elements may be in reality nothing more than combinations differing in numbers and in tactical arrangement, of some one kind of primordial atoms.

This idea was first entertained by Dr. Prout, the well-known physician and chemist. He pointed out that the atomic weights of the various so-called elements are very nearly all multiples of the half of that of hydrogen, so that the various elements may possibly be looked upon as formed by a grouping together of certain atoms of half the mass of the hydrogen atom.

M. Stas, the distinguished Belgian chemist, instituted a laborious series of experiments with the view of testing this doctrine. He came to the conclusion that the atomic weights of the various elements were not precisely multiples of the half of that of hydrogen, there being greater differences than could possibly be accounted for by errors of experiment. His

researches, however, seemed to show that in many cases there was a very near approach to Prout's imagined law. But in no case does the discrepance appear to us greatly to exceed what may easily be attributed to unavoidable impurities in the substances operated on; say only those due to the condensation of gases in the pores of solids, which (in certain cases at least) is known to amount to a very considerable quantity.

157. From another point of view there appears to be evidence in favour of the so-called elementary bodies being built up, as more or less complex arrangements of one, or at most a few, simpler kinds of matter.

There are certain groups or families amongst these elements of such a nature that the various members of one family appear to be related to each other, in the same way as the corresponding members of another family.

This clearly points to some sort of community of origin, and thus favours the idea that the elements are in reality composite structures. But the great difficulty felt by those who have favoured this idea has been the apparent impossibility of decomposing such family groups. Thus fluorine, chlorine, bromine, and iodine, while they appear to be related to one another in some peculiar manner, have yet apparently resisted all attempts at decomposition, and there are other similar instances which might easily be named.

158. It has, however, at the same time, come to be recognised, that heat of high temperature is a very powerful decomposing agent, and that its office is by

no means limited to causing the separation from one another of the molecules of a substance, as, for instance, when it separates the molecules of water-substance or H_2O from one another, as in forming water from ice, or steam from water. It is now understood that high-temperature heat has also the power of separating the atomic constituents of a single molecule from each other, so that at an extremely high temperature not only would water be driven into steam, but steam driven into oxygen and hydrogen. We are already familiar with many instances of this power possessed by high-temperature heat; thus we see carbonate of lime decomposed by the heat of the kiln into lime and carbonic-acid gas. We see also that at the high temperatures which accompany the electric spark almost all compounds are momentarily decomposed, if we may judge by the spectrum of the light which is given out. Carrying on this line of thought, we are led to imagine that, could we obtain higher temperatures than those now at our disposal, we might decompose some of those substances which at present seem to be elements.

159. Lockyer, in his astronomical researches, has recently started this question. He argues that in the sun and stars, and more especially in the whiter stars, there are temperatures very much higher than any which have been here produced. He assumes too that simplicity of constitution accompanies a simple spectrum, an hypothesis which is consistent with the fact that compounds as a rule give spectra much more complicated than those of simple substances. Now it is a curious circumstance that the atmo-

spheres of some of the whiter stars, such as Sirius, do not appear to contain anything but hydrogen ; at least we have no indication that they do ; other stars, again, of less whiteness, in addition to hydrogen, have such substances as iron, sodium, etc., while yellow, orange, and blood-red stars and variable stars, appear to contain in their atmospheres substances which are compounds. If then it be true that as a rule the atmospheres of the whiter stars contain the fewer elements and those of smallest atomic weight, and that as stars diminish in whiteness their atmospheres rise in complexity of structure, in fine, if we have reason to associate together whiteness and simplicity, this undoubtedly tells in favour of the power of high-temperature heat to split up the so-called elements.

We conclude the whiter stars to be the hotter stars, from the fact that their spectra contain a greater proportion of the more refrangible rays than do those of yellow or red stars.

In fine, a speculation of this nature is not to be summarily dismissed, but ought to be retained as a working hypothesis which may in time throw great light on the ultimate constitution of the chemical elements. Is it fanciful to suppose that the passage prefixed to Chapter III. may refer to this, since (literally translated) it stands—'. . . the elements, intensely heated, shall be broken up. . . .'?

160. Let us now turn to globe development. We have alluded to this already while discussing the energy of the universe. In doing so we came to the conclusion that the original state of the visible universe was a diffused or chaotic state, in which the various particles were widely separated from one

another, but exerting on one another gravitating force, and therefore possessed of potential energy. As these particles came together, impinged on one another, or gathered into groups, this potential energy was gradually transformed into the energy of heat and into that of visible motion. We may thus imagine the cooling and (except under very strict conditions of original distribution) *necessarily* revolving matter in course of time to have thrown off certain parts of itself which would thereafter form satellites or planetary attendants, while the central mass would form the sun. We have here, in fact, the development hypothesis of Kant and Laplace, and it is greatly in favour of the truth of this hypothesis that all the planetary motions of the solar system are nearly in one plane, and also that, looking down on the system from above that plane, all these motions are seen to be in one and the same direction.

161. Assuming, therefore, that the solar system and, *pari passu*, the other sidereal systems have been formed in this way, it is very easy to see why the central mass should be so much hotter than its attendants. Two causes would conduce to this. In the first place, assuming that the heat of a mass is due to the rushing together of its particles under the force of gravitation, the velocities would be much greater for the central mass, and hence the amount of heat (per unit of mass, *i.e.* the temperature) developed would be greater also. In the next place, the body being a large one would cool less rapidly than its attendant planets. These two causes thus combine to render the largest bodies of the universe ever since their aggregation (and still more now) the

hottest, so that the same body which forms the gravitating centre of the system becomes, when required, also the dispenser of light and heat.

162. Now, without speculating about the nature or extent of the ethereal medium, we may be sure of two things. In the first place, all but an exceedingly small fraction of the light and heat of the sun and stars goes out into space and does not return to them again, or in other words, the sun and stars are slowly cooling. To restore to the sun every instant its losses by radiation, the whole celestial vault would have to radiate as powerfully as the sun does—in which case the earth and planets would very soon acquire (at their surfaces) the sun's temperature. In the next place, the visible motion of the large bodies of the universe is gradually being stopped by something which may be denominated ethereal friction. It follows from this that our own sun will gradually lose his brilliancy, and that our earth will gradually lose its orbital energy and approach the sun in a path of slowly contracting spiral convolutions. At last it will become entangled with the sun, and the result will be the conversion of the remaining orbital energy into heat, after which the two bodies will remain one.

Thus the tendency is that the sun shall ultimately absorb the various planets of the system, his heat and energy being recruited by the process. Now, let us imagine that the same processes are simultaneously going on in one of the nearer fixed stars, say for instance in Sirius.

After unimaginable ages these two stars, the Sun and Sirius, having each long since devoured his

attendants, but being nevertheless exhausted in heat-energy on account of radiation into space, may be imagined to be travelling towards one another, slowly at first, but afterwards with an accelerated motion.

They will at last approach each other with a great velocity, and finally form one system. Ultimately the two will rush together and form one mass, the orbital energy of each being converted into heat, and the matter being, in consequence, probably partly smashed into mere dust, and partly evaporated and transformed into a gaseous, nebulous condition. Ages pass away, and the large double mass ultimately shares the same fate that long since overtook the single masses which composed it; that is to say, it shrinks and throws off planets, but gives out the greater part of its light and heat into space and gradually becomes cold and dark, until at length it comes to form one of the constituents of a still more stupendous collision, and has its temperature raised once again by the conversion of visible energy into heat.

163. Our readers will remark how, by a process of this kind, the primordial potential energy of the visible universe is gradually converted into light and heat, and how this light and heat are ultimately dissipated into space. They will also remark that, as the process goes on, the masses of the universe become larger and larger. In fine, the dissipation of the energy of the visible universe proceeds, *pari passu*, with the aggregation of mass.

The very fact, therefore, that the large masses of the visible universe are of finite size, is sufficient to assure us that the process cannot have been going on for ever; or, in other words, that the visible universe

must have had its origin in time, and we may conclude that if the visible universe be finite in mass the process will ultimately come to an end. All this is what would take place, provided we allow the indestructibility of ordinary matter; but we may perhaps suppose (Art. 153) that the very material of the visible universe will ultimately vanish into the invisible.

164. There is one peculiarity of the process of development just described, which we beg our readers to note. We have supposed the visible universe, after its production, to have been left to its own laws; that is to say, to certain inorganic agencies, which for want of better knowledge we for the present call forces, in virtue of which its development took place. At the very first there may have been only one kind of primordial atom, or, to use another expression, absolute simplicity of material. As, however, the various atoms approached each other, in virtue of the forces with which they were endowed, other and more complicated structures took the place of the perfectly simple primordial stuff. Various kinds of molecules were produced at various temperatures, and these ultimately came together to produce globes or worlds, some of them comparatively small, others very large. Thus the progress is from the regular to the irregular. And we find a similar progress when we consider the inorganic development of our own world. The action of water rounds pebbles, but it rounds them irregularly; it produces soil, but the soil is irregular in the size of its grains, and variable in constitution. Wherever what may be termed the brute forces of nature are left to themselves, this is always the result: not so,

however, when organisms are concerned in the development. Two living things of the same family are more like each other than two grains of sand or than two particles of soil. The eggs of birds of the same family, the corresponding feathers of similar birds, the ants from the same ant-hill, all form groups whose members have a very strong likeness to each other.

We find this likeness still more marked when we regard certain products of human industry. Let us take, for instance, coins from the same die, or bullets from the same mould, or impressions from the same engraved plate, and we at once perceive the striking difference between products developed through inorganic means and those developed through an intelligent agent designing uniformity.

165. Let us now proceed to consider life development. Let us imagine that the primeval atoms have long since come together, various chemical substances being the result. And let us further imagine that these various substances have long since gathered themselves into worlds, of various sizes at first; but that these worlds have gradually cooled down, until one of them, the Earth, let us say, has at length reached conditions under which life (such as we know it) becomes possible. Accordingly life makes its appearance; not the life that now is, but something much ruder and simpler. But in process of time we find quite a different order of organised beings; a higher and more complete type has appeared, and the type continues to rise until it culminates in the production of man, a being endowed with intelligence, and capable of reasoning upon the phenomena around him. Now, if man reviews these organised forms

which exist on the earth side by side with himself, he perceives at once that a number of individuals possess certain characteristics in common, and he gives expression to this experience by saying that these individuals are all of one species. 'When we call a group of animals or of plants a species,' says Professor Huxley,[1] 'we may imply thereby, either that all these animals or plants have some common peculiarity of form or structure; or we may mean that they possess some common functional character. That part of biological science which deals with form and structure is called Morphology; that which concerns itself with function, Physiology. So that we may conveniently speak of these two senses, or aspects, of "species"—the one as morphological, the other as physiological. . . . Thus horses form a species, because the group of animals to which that name is applied is distinguished from all others in the world by the following constantly associated characters:—They have, 1. a vertebral column; 2. mammae; 3. a placental embryo; 4. four legs; 5. a single well-developed toe in each foot, provided with a hoof; 6. a bushy tail; and 7. callosities on the inner sides of both the fore and the hind legs. The asses, again, form a distinct species, because, with the same characters, as far as the fifth in the above list, all asses have tufted tails, and have callosities only on the inner side of the fore legs.'

But very often the morphological peculiarities of a species are more easily recognised than expressed. No one, for instance, would fail to rank the horse as one species and the ass as another, even while ignorant of some of those specific peculiarities which the natur-

[1] *Lay Sermons, Essays, and Reviews.*

alist selects as conveying the best scientific account of their difference.

166. Let us now regard the question of species from its physiological point of view. Suppose that two individuals, A and B, of different sexes, breed freely together, producing offspring, and that two individuals, C and D, do the like.

Now, if the offspring of A and B is capable of breeding freely with that of C and D, producing offspring, generation after generation, then A, B, C, and D may be said to belong to the same physiological species.

To take an illustration borrowed from Professor Huxley: let us imagine that A is an Arab, and B a dray-horse; also that C is a dray-horse, and D an Arab. Now the progeny of these two pairs will all be mongrels, holding a position intermediate between that of the Arab and the dray-horse; but they will be perfectly fertile amongst themselves when matched together. We therefore conclude that the dray-horse and the Arab are not distinct physiological species, but only varieties of the same species. Again, let A be a horse and B an ass, also let C be an ass and D a horse. The pairs will still have offspring, and these will be mules, having a character intermediate between that of the horse and that of the ass; but, on the other hand, these mules will not be able to breed together amongst themselves so as to produce offspring. We are therefore justified in asserting that a horse and an ass are of different physiological species.

If we should ever attempt to pair together animals much more unlike each other than the horse and the

ass, we should simply fail. They will not come together, and we cannot tell whether, if they did, they would be capable of producing progeny. We may therefore conclude that, as matter of fact, there are certain well-marked physiological species that will not breed with each other at all, while there are other species also physiologically distinct, but not so markedly separated from each other, that may be brought to breed together, their offspring being infertile.

167. The most apparent conclusion to be deduced from these facts would be that of the invariability of species, and of the impossibility of its transmutation —the infertility of hybrids being the law which prevents any such transmutation from taking place. And as the physiological species cannot be made different the apparent conclusion is that in times past they have been always the same as they are now. If this be allowed, it follows that inasmuch as they took their origin in time, they must have originally been produced very much as they are at the present moment, —a separate act of production being required for each species, or rather two separate acts for each species. This position has always been regarded as a stronghold by a certain class of theological thinkers, and they have resented the attempts of men of science to obtain any other explanation of the origin of species.

Men of science have, on the other hand, asserted their right to discuss this question with the same freedom as any other. Our point of view is somewhat different from that of either of these two parties. We think it is not so much the right or privilege as the bounden duty of the man of science to put back the

direct interference of the Great First Cause—the unconditioned—as far as he possibly can in time. This is the intellectual or rather theoretical work which he is called upon to do—the post that has been assigned to him in the economy of the universe.

If, then, two possible theories of the production of any phenomenon are presented to the man of science, one of these implying the immediate operation of the unconditioned, and the other the operation of some cause existing in the universe, we conceive that he is called upon by the most profound obligations of his nature and work to choose the second in preference to the first. But we have already sufficiently discussed this question in a previous part of this book (Art. 85).

168. When we examine closely into the phenomena of life we find that side by side with the general law, that like produces like, there is a tendency to minor variations.

Thus we have already agreed to consider dray-horses and Arabs as varieties of the species horse; and in like manner pouters, carriers, fan-tails, and tumblers are all varieties of the species rock-pigeon. We are therefore led to ask how such varieties were originally produced, and how they become perpetuated after their production.

Now it is well known that there occurs occasionally an accountable variation, so marked in its nature as to be worthy of historical record. Two very interesting and instructive instances of this are given by Professor Huxley, and we take the liberty of quoting these in the Professor's own words:—

'The first of them is that of the "Ancon," or "Otter" sheep,

of which a careful account is given by Colonel David Humphreys, F.R.S., in a letter to Sir Joseph Banks, published in the *Philosophical Transactions* for 1813. It appears that one Seth Wright, the proprietor of a farm on the banks of the Charles River in Massachusetts, possessed a flock of fifteen ewes and a ram of the ordinary kind. In the year 1791, one of the ewes presented her owner with a male lamb differing, for no assignable reason, from its parents by a proportionally long body and short bandy legs, whence it was unable to emulate its relatives in those sportive leaps over the neighbours' fences, in which they were in the habit of indulging, much to the good farmer's vexation.

. . . . . .

'With the 'cuteness characteristic of their nation, the neighbours of the Massachusetts farmer imagined it would be an excellent thing if all his sheep were imbued with the stay-at-home tendencies enforced by nature upon the newly arrived ram, and they advised Wright to kill the old patriarch of his fold, and install the Ancon ram in his place. The result justified their sagacious anticipations. . . . The young lambs were almost always either pure Ancons or pure ordinary sheep. But when sufficient Ancon sheep were obtained to interbreed with one another it was found that the offspring was always pure Ancon.'

'The second case is that detailed by a no less unexceptionable authority than Réaumur, in his *Art de faire éclore les Poulets*. A Maltese couple named Kelleia, whose hands and feet were constructed upon the ordinary human model, had born to them a son, Gratio, who possessed six perfectly moveable fingers on each hand, and six toes, not quite so well formed, on each foot. No cause could be assigned for the appearance of this unusual variety of the human species. But however they may have arisen, what especially interests us is to remark that, once in existence, varieties obey the fundamental law of reproduction, that like tends to produce like, and their offspring exemplify it by tending to exhibit the same deviation from the parental stock as themselves. Indeed, there seems to be in many instances a prepotent influence about a newly arisen

variety which gives it what we may call an unfair advantage over the normal descendants from the same stock. This is strikingly exemplified by the case of Gratio Kelleia, who married a woman with the ordinary pentadactyle extremities and had by her four children, Salvator, George, André, and Marie. Of these children Salvator, the eldest boy, had six fingers and six toes, like his father; the second and third, also boys, had five fingers and five toes, like their mother, though the hands and feet of George were slightly deformed; the last, a girl, had five fingers and five toes, but the thumbs were slightly deformed. The variety thus reproduced itself purely in the eldest, while the normal type reproduced itself purely in the third, and almost purely in the second and last; so that it would seem, at first, as if the normal type were more powerful than the variety. But all these children grew up and intermarried with normal wives and husbands, and then note what took place—Salvator had four children, three of whom exhibited the hexadactyle members of their grandfather and father, while the youngest had the pentadactyle limbs of the mother and grandmother; so that here, notwithstanding a double pentadactyle dilution of the blood the hexadactyle variety had the best of it. The same prepotency of the variety was still more markedly exemplified in the progeny of two of the other children, Marie and George. Marie (whose thumbs only were deformed) gave birth to a boy with six toes, and three other normally formed children; but George, who was not quite so pure a pentadactyle, begot, first, two girls, each of whom had six fingers and toes; then a girl with six fingers on each hand, and six toes on the right foot, but only five toes on the left; and lastly, a boy with only five fingers and toes. In these instances, therefore, the variety, as it were, leaped over one generation to reproduce itself in full force in the next. Finally, the purely pentadactyle André was the father of many children, not one of whom departed from the normal parental type.'

169. The instances now quoted illustrate two things. Both tell us how varieties arise, we may say spontaneously, or in other words we cannot tell how; and the former instance, that of the Ancon breed, shows

us moreover that such varieties when they do occur may be rendered permanent by means of artificial selection. If the six-fingered descendants of Gratio Kelleia had been forced to intermarry amongst themselves it is highly probable that we should have had a permanent hexadactyle variety of the human race. It has likewise been shown by Charles Darwin that the pouter, the fan-tail, the carrier, and the tumbler are all varieties of the common rock-pigeon.

170. It thus appears that permanent varieties may be produced by artificial selection. Now Darwin and Wallace have brought before us the very great fact that similar changes can also be produced by natural selection.

To illustrate this, let us imagine a slight variety to arise spontaneously, we do not know how. Having arisen there is a 'prepotent influence' about it which enables it to secure a considerable proportion of offspring having its own characteristics. Now, suppose that the characteristics are such as to adapt the individuals possessing them more perfectly to the conditions of nature which surround them. When, by breeding amongst themselves, the new variety is rendered permanent, the members of this variety will, therefore, have an advantage over their elder brethren so far as certain conditions of nature are concerned, will in fact succeed better in the struggle for existence, and will ultimately displace the elder branches. Thus the struggle for existence bears to natural selection the same relation as man bears to artificial selection.

171. We now come to the real point of difficulty, or at least the unproved point, in the Darwinian

hypothesis. We may cross one race with another, but we do not obtain, so far as we know, those phenomena of infertility which are exhibited when we cross distinct species with each other. The Ancon sheep were perfectly fertile when matched with their elder brethren, and the dray-horse and the Arab, or the pouter and the tumbler, breed together as easily as if they were of the same race. But if we cannot produce infertility, how can we apply the results of artificial selection to account for the origin of species?

This difficulty is met by Darwin and his followers in this way:—'It is not as yet proved,' says Professor Huxley, 'that a race ever exhibits, when crossed with another race of the same species, those phenomena of hybridisation which are exhibited by many species when crossed with other species. On the other hand, not only is it not proved that all species give rise to hybrids infertile *inter se*, but there is much reason to believe that, in crossing, species exhibit every gradation from perfect sterility to perfect fertility.' This appears to carry weight; the old theory went with a leap from perfect fertility to perfect sterility, and did not contemplate the possibility of a continuous gradation from the one extreme to the other; at least its argument was founded upon the neglect of such a gradation. But if there be a gradation of this kind, it follows that infertility will merely represent the results of crossing two species whose functional characteristics are very different from each other; and, on the other hand, the reason why artificially produced varieties are not infertile when crossed with one another may only be

that the experiment has not been continued long enough.

Time, in fact, is the essential requisite in all such attempts to imitate nature.

172. In connection with this subject, Mr. Darwin has remarked that certain plants are more fertile with the pollen of another species than with their own; and Professor Huxley tells us that there are certain *fuci* whose male element will fertilise the ovule of a plant of distinct species, while the males of the latter species are ineffective with the females of the first. So obscure in some of its branches is the working of the reproductive system.

Again, the following remark by Mr. Darwin is very suggestive:—

'First crosses between forms known to be varieties, or sufficiently alike to be considered as varieties, and their mongrel offspring, are very generally, but not quite universally, fertile. Nor is this nearly general and perfect fertility surprising, when we remember how liable we are to argue in a circle with respect to varieties in a state of nature; and when we remember that the greater number of varieties have been produced under domestication, by the selection of mere external differences, and not of differences in the reproductive system. In all other respects, excluding fertility, there is a close general resemblance between hybrids and mongrels.'

173. The result of all these speculations is to render it probable that there may be in nature, give it time enough, a process which leads to the transmutation of species.

The accumulation of successive differences, each

representing some element of success in the struggle for life, may easily be imagined to be capable of producing, in the course of ages, a very great change.

Reasoning out this hypothesis, the more advanced followers of Mr. Darwin do not hesitate to describe all the varieties of living things, including man, as the results of development from some primordial germ taking place throughout the course of immeasurable ages. And Mr. Darwin himself, in his work on the Descent of Man, lays great stress on the occurrence of homologous structures in man and the lower animals, as well as on the development in man of rudimentary structures, which are either absolutely useless to their possessor, or of very slight service indeed, but which appear to serve as an index of the various stages through which the human species has passed in its progress upwards from lower forms of life.

174. Mr. Wallace, however, sees in the production of man the intervention of an external will.

He remarks that the lowest types of savages are in possession of a brain, and of capacities far beyond any use to which they could apply them in their present condition, and that therefore they could not have been evolved from the mere necessities of their environments.

175. Finally, Professor Huxley imagines the possibility of the Darwinian hypothesis requiring modification. Alluding to the assumed circularity of the planetary orbits which followed the establishment of the Copernican hypothesis (Art. 69), he remarks:—

'But the planetary orbits turned out to be not quite circular after all, and, grand as was the service

Copernicus rendered to science, Kepler and Newton had to come after him. What if the orbit of Darwinism should be a little too circular? What if species should offer residual phenomena, here and there, not explicable by natural selection? Twenty years hence naturalists may be in a position to say whether this is, or is not, the case; but in either event they will owe the author of "The Origin of Species" an immense debt of gratitude.'

176. We will defer to our last chapter some further remarks on Mr. Darwin's hypothesis. Meanwhile, before concluding, let us briefly allude to the original production of living things on our globe. It may, perhaps, eventually be possible by means of a hypothesis of evolution, to account for the great variety of living forms on the supposition of a single primordial germ to begin with; but the difficulty still remains how to account for this germ.

It is against all true scientific experience that life can appear without the intervention of a living antecedent. How then are we to explain the production of the primordial germ?

The difficulty of doing so from our point of view would appear to be unusually great, for we have come to the conclusion that, as a matter of scientific principle, we cannot admit any such breach of continuity as a pure act of creation in time would imply.

If, then, a pure act of creation in time be an inadmissible hypothesis, and if the hypothesis of Abiogenesis be equally inadmissible, our readers may well ask how are we to surmount the difficulty. For our reply to this question, we must once more beg to refer them to our concluding chapter.

CHAPTER VI.

SPECULATIONS AS TO THE POSSIBILITY OF SUPERIOR INTELLIGENCES IN THE VISIBLE UNIVERSE.

'The earth hath bubbles, as the water has,
And these are of them.'—SHAKESPEARE, *Macbeth.*

177. OUR readers are now aware from what we have said in Chapter II. that the two great requisites for organised existence are, in the first place, an organ of memory, giving the individual a hold upon the past, and secondly, the possibility of varied action in the present, and that unless these two things are fulfilled life is simply inconceivable.

Again, in Chapters III., IV., and V. we have sufficiently discussed the visible universe and its potentialities. We have seen that although at present it contains the essential requisites for organised existence, yet, in the remote future, a time will necessarily arrive when, through a degradation of the Energy of this universe, or at least of one part of it, that variety of motion which is essential to life will be unattainable. Immortality is, therefore, impossible or hardly possible in such a universe; but even allowing all this to be the case, it is at least conceivable that man may be at death drafted off into some superior rank of being connected with the present universe, and thence ultimately removed into a new order of

things when the present universe shall have become effete.

Let us now, therefore, very briefly discuss the question as to the possibility of intelligences superior to man existing in the present visible universe. And, in order to commence this inquiry, let us analyse with some minuteness the physical source of that peculiarity which the present universe possesses, in virtue of which it affords living beings the means of a varied existence. Whence is all this power derived? How comes it about that a living being possesses that abruptness and spontaneity of action which peculiarly characterise it? In fine, let us consider the exact position of life in the present physical universe.

178. Now, in the first place, it is well known that equilibrium may be of two kinds, stable and unstable, and if we take an egg balanced on its end at the edge of a table as an example of mechanical instability, we shall see that it 'depends upon some external impulse so infinitesimally small as to elude our observation whether the egg shall fall upon the floor and give rise to a comparatively large transmutation of energy, or whether it shall fall upon the table and give rise to a transmutation comparatively small.'[1]

But, just as there are other forces besides gravity, so there are other varieties of instability besides that which we treat of in mechanics.

We may, for instance, have molecular instability, such as characterises water cooled below the freezing point, or a supersaturated solution of Glauber's salt, where the advent of the smallest possible crystal of

[1] Stewart on the *Conservation of Energy*.

ice or of Glauber's salt is sufficient to bring about a marked molecular change in the liquid, which immediately becomes thick with deposited crystals; or again, we may have chemical instability in which the slightest impulse of any kind may determine a chemical change, just as in mechanical instability the slightest possible impulse may determine a mechanical change. Thus fulminating silver or nitroglycerine are familiar examples of chemical instability in which the slightest blow or the smallest spark may be sufficient to bring about an instantaneous and violent generation of heated gas.

179. Again, all machines—that is to say, all material systems—must necessarily be of two kinds, one of which makes use of the stable forces of nature and the other of the unstable. The following quotation from a work on Energy, by one of the authors of this book, will sufficiently explain what is meant:[1]—

'When we speak of a structure, or a machine, or a system, we simply mean a number of individual particles associated together in producing some definite result. Thus, the solar system, a timepiece, a rifle, are examples of inanimate machines; while an animal, a human being, an army, are examples of animated structures or machines. Now, such machines or structures are of two kinds, which differ from one another not only in the object sought, but also in the means of attaining that object.

'In the first place, we have structures or machines in which systematic action is the object aimed at, and in which all the arrangements are of a conservative nature, the element of instability being avoided as much as possible. The solar system, a timepiece, a steam-engine at work, are examples of such machines, and the characteristic of all such is their *calculability*. Thus the skilled astronomer can tell, with the utmost precision, in what place the moon or the planet Venus will be found this

[1] Stewart on the *Conservation of Energy*.

time next year. Or again, the excellence of a timepiece consists in its various hands pointing accurately in a certain direction after a certain interval of time. In like manner we may safely count upon a steamship making so many knots an hour, at least while the outward conditions remain the same. In all these cases we make our calculations, and we are not deceived —the end sought is regularity of action, and the means employed is a stable arrangement of the forces of nature.

'Now, the characteristics of the other class of machines are precisely the reverse.

'Here the object aimed at is not a regular, but a sudden and violent, transmutation of energy, while the means employed are unstable arrangements of natural forces. A rifle at full-cock, with a delicate hair-trigger, is a very good instance of such a machine, where the slightest touch from without may bring about the explosion of the gunpowder, and the propulsion of the ball with a very great velocity. Now, such machines are eminently characterised by their *incalculability*.

'It is thus apparent that, as regards energy, structures are of two kinds. In one of these, the object sought is regularity of action, and the means employed, a stable arrangement of natural forces ; while in the other, the end sought is freedom of action, and a sudden transmutation of energy, the means employed being an unstable arrangement of natural forces.

'The one set of machines are characterised by their calculability—the other by their incalculability. The one set, when at work, are not easily put wrong, while the other set are characterised by great delicacy of construction.'

180. Having thus defined the two kinds of machines, let us now see to what extent a living being may be regarded as a machine, and also to which of these two categories he belongs.

What our machines enable us to do is merely to transform energy. Our readers are well aware, by what we have already said (Art. 102), that it is just as impossible to create energy as it is to create matter.

Thus a clock has to be wound up before it will go; an engine has to be stoked with coal; a rifle or cannon has to be charged with powder; and in short, all machines, whether delicately constructed or not, whether calculable or incalculable, are merely transmuters of energy and not creators of it.

To this law the living being is no exception. The creatures of this world (and it is of such we are now speaking) are certainly not creators of energy; but in respect of the great law of the conservation of energy, such beings must be regarded in the very same light as any other machines.

But there is yet another analogy between living beings and inanimate machines. When we study the working of any machine, we find that each transformation of energy brought about has a material antecedent; the effect produced has a cause from which it springs, and this cause is one which we are probably able to recognise from our knowledge of the laws of matter. To take an example: in a steam-engine the amount of work produced depends upon the amount of heat carried from the boiler to the condenser; and this amount depends in its turn upon the amount of coal which is burned in the furnace of the engine. In like manner, the velocity of the bullet which issues from a rifle depends upon the transformation of the energy of the powder; this in its turn depends upon the explosion of the percussion cap; this again upon the fall of the trigger; and lastly this upon the finger of the man who fires the rifle.

Now, without attempting to define what life is, and leaving all speculations regarding it to our last chapter, we yet think it may safely be said that a

living being is analogous to a machine in this particular also.

Let us take the man who fires the rifle. We can trace back the motion of his forefinger to the contraction of a muscle; and we can go even further back and connect this contraction with a stimulus sent along the nerves from the brain, so that a material effect is here seen to be brought about by a material antecedent, just as truly as in an inanimate machine. Indeed, we may generalise, and say that, *so far as we can physically investigate a living being*, we may take it for granted that a material effect is due to a strictly material antecedent in his case also.

181. We have thus discussed two respects in which a living being is analogous to a machine, and the next point is to determine which of the two classes of machines most resembles the living being. Is he analogous to the solar system, a steam-engine, or a clock? or is he rather analogous to some delicately constructed machine, such, for instance, as a rifle? There can, we think, be no doubt that a living being most resembles a delicately constructed machine. For what is the characteristic of such a machine? It is that in it a comparatively great transformation of energy may be brought about by a comparatively small physical antecedent. Thus a slight breath of air may determine the fall of the egg off the table, or a slight tap the explosion of a large quantity of fulminating silver. So in the human being, a very small and obscure transmutation of energy in the mysterious brain-chamber may determine some very violent motion. 'Life is not a bully who swaggers out into the open universe, upsetting the laws of energy in all

directions, but rather a consummate strategist, who, sitting in his secret chamber over his wires, directs the movements of a great army.'[1]

182. Granting then that a living being is a delicately constructed machine, the next point is to determine what process of delicacy, what peculiar arrangement of unstable forces, is employed in his construction? Now it is very easy to perceive that the delicacy in this case is brought about by an unstable arrangement of chemical forces. It is plain that the body of an animal is a chemically unstable product, and if, as one consequence of this, great freedom of action and delicacy are possessed during life, it is another consequence that the extinction of life is very speedily followed by decay.

The body then owes its delicacy to its chemically unstable nature; to a peculiar collocation of particles which certainly would not, in virtue of their own merely physical forces, have united themselves together as we find them in the body.

183. To what, then, is due this peculiar grouping of particles in the living body?

We reply that it is, in one sense at least, derived from the food which is eaten. If animal food is eaten, it is of course derived from the body of the animal which is consumed. That animal may possibly have derived it from another animal, but more probably it has been derived in this case direct from the vegetable world. Ultimately, therefore, it is to this world that we must look as the source of that delicately constructed substance which plays such a wonderful and important part in the animal economy. If we go

[1] Stewart on the *Conservation of Energy*.

one link further back in the chain of causation, we shall be carried from the vegetable world to the sun as the great and ultimate physical source of that high-class energy and delicacy of construction which characterise vegetable products. It is, in truth, owing to the actinic rays of our luminary that vegetable tissue is manufactured in the leaves of plants, the carbonic acid of the air being decomposed, and oxygen given out, while the carbon, united with other substances, and modified thereby, is retained by the plant to form part of its substance, or perchance to become the food of animals.

184. We have therefore now arrived at the conclusion that the delicacy of construction which our frames require is ultimately derived from the sun, so far at least as the visible universe is concerned. If then we would reply to the question of this chapter, whether or not there may be beings superior to man connected with this present universe, let us look abroad and endeavour to ascertain whether there be in this universe any other obvious process of delicacy besides that which characterises the bodies of animals like ourselves.

Now, it has been pointed out that, in the atmospheric changes of this world, and more particularly of the sun, we have processes of great delicacy. It is believed that the positions of the planets Mercury and Venus affect the behaviour of sun-spots, and thus determine the conditions of atmospheric changes on the surface of our luminary that are absolutely overwhelming in their magnitude. We have only to reflect that a large sun-spot might swallow up fifty planets like our earth, and that some of the currents con-

nected with it move at the rate of 100 miles per second, in order to realise the enormous scale of these solar outbreaks. Again, it is believed that the state of the solar surface with regard to spots determines the storms of our earth, so that hurricanes are most numerous in the Indian Ocean as well as on the coast of America during years of maximum sun-spots.[1]

But if such results are brought about by the relative positions of the planets of our system, it is evident that the cause is more analogous to the pulling of the trigger of a cannon ready to go off than to a downright blow. In fact, a vast transformation of energy in the sun is brought about by some obscure and ill-understood but comparatively trivial cause connected with the position of the nearer planets of our system. We have here a case where the magnitude of the effect is out of all proportion to that of the antecedent; now this is, in other words, the definition of delicacy already given (Art. 179).

But, again, if delicacy of construction characterise the meteorological changes in the various members of our system, it is entirely absent from the orbital motions of these bodies. These want that great characteristic of delicacy, *incalculability;* for they are not only pre-eminently calculable, but are now calculated years beforehand as part of the regular business of the world. On the other hand, the meteorological changes of our earth and of the sun come upon us with all the abruptness characteristic of delicacy, and are eminently incalculable. The hurricane and the lightning flash are processes of Nature which man has in every age been prone to associate with personal

[1] See Meldrum on the *Periodicity of Rainfall.*

intelligences. He has instinctively recognised the similarity between these abrupt and startling phenomena and the actions of an angry and powerful being.

185. It may no doubt be long since there has been anything like an extensive worship of the powers of nature amongst the civilised nations of the earth, but there may yet be found, even at the present day, especially amongst imaginative races, and in wild and mountainous regions, a lingering belief that personal agents are concerned in the more startling natural phenomena.

Such a belief was extensively prevalent during the middle ages, and whole volumes might easily be filled with an account of mediæval superstitions and legends relating to this subject, sometimes dark and terrible, and at other times possessing a peculiar and pathetic beauty which does not belong to anything else. The air, the earth, and the water have all been peopled with spirits; some of them friendly to man, some of them his deadly enemies. They are powerful, and conscious of their power, but at the same time profoundly and mournfully aware that they are without a soul. Their life depends, it may be, upon the continuance of some natural object, and hence for them there is no immortality. Sometimes, however, an elemental spirit procures a soul by means of a loving union with one of the human race, and the beautiful romance of Undine is built upon this fancy.

At other times the reverse happens, and the soul of the mortal is lost who, leaving the haunts of men, associates with these soulless but often amiable and affectionate beings. 'The Forsaken Merman,' by

Matthew Arnold, expresses this fancy in a very beautiful and touching manner:—

'Children dear, was it yesterday
(Call once more) that she went away?
Once she sate with you and me
On a red gold throne in the heart of the sea,
And the youngest sate on her knee.
She comb'd its bright hair, and she tended it well,
When down swung the sound of the far-off bell.
She sigh'd, she look'd up through the clear green sea;
She said, "I must go, for my kinsfolk pray
In the little grey church on the shore to-day.
'Twill be Easter time in the world—ah me!
And I lose my poor soul, Merman, here with thee."
I said, "Go up, dear heart, through the waves;
Say thy prayers and come back to the kind sea-caves."
She smiled, she went up through the surf in the bay.
Children dear, was it yesterday?'

186. A conception, in some respects analogous to that now mentioned, but in other respects very different from it, is that which attributes a soul to the universe; and it has even been imagined that the whole visible universe forms, as it were, one gigantic brain.

Others again appear inclined to believe that there may be many cosmical intelligences, each embracing the whole universe, and therefore interpenetrating one another, and at the same time taking part in its government by means of such processes of delicacy as those we have mentioned.

187. Now, before proceeding further in the discussion of these speculations, let us here state more definitely than we have yet done what is the real point in question.

It is not so much the possibility of the delicate processes of nature being directed by an intelligent

agency; this is in reality a different question, and one which will be discussed in our concluding chapter. But the question now before us is, whether any such agency may be said to belong to the present visible universe?

To make our meaning clear: we know that we ourselves belong to the present visible universe. Again, there are many of us who believe that angelic intelligences are the ministers of God's providence. Now, whether this doctrine be true or not (and we are not now concerned about its truth), it is evident that such intelligences cannot be said to belong to the present physical universe. The organisation which they possess, and without which (Art. 61) we cannot imagine a finite intelligence to exist, is most assuredly nothing that can be perceived by our bodily senses, nor can we imagine that their existence is at all dependent on the fate of the visible universe; in fine, they do not belong to it.

Our present question, therefore, is whether we can associate the delicate cosmical processes of the visible universe with the operations of intelligences residing in this universe and belonging to it, and to this question we must assuredly give a negative reply.

188. We entertain no doubt that man and beings at least analogous to man represent the highest order of living things connected with the present visible universe.

For, in the first place, although there is abundant evidence of delicacy of construction in the cosmical processes of this universe, there is no evidence of an organisation such as that which observation leads us to associate with the presence of life.

In the next place, whatever view we may entertain of the Darwinian hypothesis and the relation of man to the lower animals, there can be no doubt that they are all of a similar physical construction. What physiologists term the matter of life is very much the same in all, so that the body of any one animal may in general afford food for any other. Now, is it likely that there are two living systems, absolutely distinct and as different from one another as we can well imagine, both connected with the visible universe?

We think this view would imply such a want of unity in the plan of development as to be absolutely fatal to its reception, even as a working hypothesis. On these accounts, therefore, we do not hesitate to dismiss the conception of a superior order of beings connected with the present physical universe as one which is altogether untenable.

189. If we now turn from the verdict of science to the sacred writings of the Jews, we find that one grand idea which pervades the whole of the Old Testament is man's absolute superiority and practical sovereignty over all created beings whom he can perceive otherwise than with the *mind's eye.*

He is supreme, or it is part of his work on earth to become supreme, over all that can be perceived by his senses, *i.e.* all the visible and tangible world. Thus we read in Gen. i. 28: 'And God blessed them: and God said unto them, Be fruitful, and multiply, and replenish the earth, and subdue it; and have dominion over the fish of the sea, and over the fowl of the air, and over every living thing that moveth upon the earth.'

Again, we read (Psalm viii. 5, 6): 'For thou hast made him a little lower than the angels, and hast crowned him with glory and honour. Thou madest him to have dominion over the works of thy hands; thou hast put all things under his feet.' [It appears that the correct reading of the first part of this is, 'Thou hast made him little less than divine,' etc.]

190. It is worthy of note that the same idea is still more fully developed in the New Testament, where it is confessed that, in one very important respect, this superiority of man is seen to fail.

He has greatly enlarged his powers over nature, and has by these means much ameliorated the condition of his race; yet death overtakes him just as remorselessly and as ruthlessly as if he were a savage of no account. He may meet death fearlessly, conscious that he has at least done something for the good of his fellows. But what does it all amount to? Death will ultimately overtake the race just as remorselessly as the individual. Now it is this fearful enemy, this terrible exception to the domination of man, which Christ, as the Son and type of man, is commissioned to destroy. Thus we read (1 Cor. xv. 25): 'For he must reign, till he hath put all enemies under his feet. The last enemy that shall be destroyed is death. For he hath put all things under his feet.' And presently (verse 54) the apostle breaks forth into the following triumphant and beautiful language:—'So when this corruptible shall have put on incorruption, and this mortal shall have put on immortality, then shall be brought to pass the saying that is written, Death is swallowed up in victory.' Again we read (Heb. ii. 8): 'For in that he put all in subjection

under him, he left nothing that is not put under him. But now we see not yet all things put under him: but we see Jesus, who was made a little lower than the angels for the suffering of death, crowned with glory and honour; that he by the grace of God should taste death for every man. For it became him, for whom are all things, and by whom are all things, in bringing many sons unto glory, to make the Captain of their salvation perfect through sufferings.' [Here again it appears that instead of the phrase 'made a little lower than the angels,' we should read, 'made for a little time lower than the angels'—*i.e.* an idea identical in meaning with the phrase 'made under the law,' the Old Testament law being viewed as administered by angels. From this dispensation, in which cosmical powers come between man and God, Christ frees us, by himself for a little time entering into it, and even under it meeting death.]

191. From all this we may conclude that both science and religion tell us the same tale. They inform us that man, and beings similar to man, are at the head of the visible universe. No doubt religion informs us, in addition to this, that there are other beings above man, but these do not live in the visible universe, but in that which is unseen and eternal.

CHAPTER VII.

THE UNSEEN UNIVERSE.

'For I reckon, that the sufferings of this present time are not worthy to be compared with the glory which shall be revealed in us. For the earnest expectation of the creature waiteth for the manifestation of the sons of God.'—ST. PAUL (Rom. viii. 18, 19).

'Rabbi Jacob said, "This world is as it were the anteroom of the world to come. Prepare thyself in the anteroom so that thou mayest be fit to enter the banquet-room."'—*Mishna, Pirke Aboth*, chap. iv. par. 16.

'Eternal process moving on
From state to state the spirit walks,
And these are but the shatter'd stalks,
Or ruin'd chrysalis of one.'—TENNYSON.

192. IN the preceding chapters we have examined by the light of our present knowledge the possibilities contained in the visible universe. What is it good for in the way of possible immortality? is the question we have tried to answer. It will have been seen that the reply is eminently unfavourable. If we take the individual man to begin with, we find that he lives his short tale of years, and that then the visible machinery which connects him with the past, as well as that which enables him to act in the present, falls into ruin and is brought to an end. If any germ or potentiality remains, it is certainly not connected with the visible order of things.

If we next consider the human race we find that the state of advancement to which they have attained is in many respects greatly due to their physical surroundings. Coal and iron have been as instrumental in promoting knowledge as Galileo and Newton, but our whole stock of these materials will come to an end. By economy it may be possible to lengthen out the period during which they can be supplied, but is it not manifest that we are year by year exhausting them as sources of available energy?

Are we not inevitably led to conclude that our present state cannot last even for a lengthened period, but will be brought to an end long before the inevitable dissipation of energy shall have rendered our earth unfit for habitation?

193. But even supposing that man, in some form, is permitted to remain on the earth for a long series of years, we merely lengthen out the period, but we cannot escape the final catastrophe. The earth will gradually lose its energy of rotation, as well as that of revolution round the sun. The sun himself will wax dim and become useless as a source of energy, until at last the favourable conditions of the present solar system will have quite disappeared.

But what happens to our system will happen likewise to the whole visible universe (Art. 116), which will, if finite, become in time a lifeless mass, if indeed it be not doomed to utter dissolution. In fine, it will become old and effete, no less truly than the individual—it is a glorious garment this visible universe, but not an immortal one—we must look elsewhere if we are to be clothed with immortality as with a garment.

194. Now, if we regard the dissipation of energy which is constantly going on, we are at first sight forcibly struck with the apparently wasteful character of the arrangements of the visible universe. All but a very small portion of the sun's heat goes day by day into what we call empty space, and it is only this very small remainder which can be made use of by the various planets for purposes of their own. Could anything be more perplexing than this seemingly prodigal expenditure of the very life and essence of our system? That all but a petty fraction of this vast store of high-class energy should be doing nothing but travelling outwards in space at the rate of 188,000 miles per second is hardly conceivable, especially when the result of it is the inevitable destruction of the visible universe, unless we imagine this to be infinite, and so capable of endless degradation.

195. If, however, we continue to dwell upon this astounding phenomenon, we begin to perceive that we are not entitled to assert that this luminous energy does nothing but continue to travel outwards. It is perhaps too much to say that Struve's speculations prove an ethereal absorption, but they must be taken in connection with other considerations. We have already maintained (Art. 151), that we cannot regard the ether as a perfect fluid, and that we must look to the unseen portion of the universe as that out of which the seen has been developed.[1] We must therefore regard this unseen as possessing an extremely complicated structure. Now it is not easy to suppose that in such a substance all vibratory

[1] See Article by Prof. Clifford, *Fortnightly Review*, June 1875.

motion should pass outwards without in the smallest degree becoming absorbed or changing its type.

We are prepared doubtless to expect a great difference between the unseen and visible matter in this respect, but can hardly imagine that the unseen is absolutely free from the capacity of altering the type of the energy which passes through it. Such a hypothesis appears to us to violate the principle of continuity.

196. But we may go even further than luminiferous vibrations which take their rise chiefly at the surfaces of bodies, and extend our speculations into the interior of substances, since the law of gravitation assures us that any displacement which takes place in the very heart of the earth will be felt throughout the universe, and we may even imagine that the same thing will hold true of those molecular motions (Art. 56) which accompany thought. For every thought we think is accompanied by a displacement and motion of the particles of the brain, and we may imagine that somehow—in all probability by means of the medium—these motions are propagated throughout the universe. Views of this nature were long ago entertained by Babbage, and they have since commended themselves to several men of science, and amongst others to Jevons. 'Mr. Babbage,' says this author,[1] 'has pointed out[2] that if we had power to follow and detect the minutest effects of any disturbance, each particle of existing matter must be a register of all that has happened.'

197. But again, we are compelled to imagine (Art. 152) that what we see has originated in the unseen.

[1] *Principles of Science*, vol. ii. p. 455.

[2] So-called Ninth Bridgewater Treatise.

And we must resort to the unseen not only for the origin of the molecules of the visible universe, but also for an explanation of the forces which animate these molecules (Art. 150). So that we are compelled to conclude that every motion of the visible universe is caused by the unseen, and that its energy is ultimately carried again into the unseen.

198. To conclude: we are thus led to believe that there exists now an invisible order of things intimately connected with the present, and capable of acting energetically upon it—for, in truth, the energy of the present system is to be looked upon as originally derived from the invisible universe, while the forces which give rise to transmutations of energy probably take their origin in the same region.

And it appears to us to be more natural to imagine that a universe of this nature, which we have reason to think exists, and is connected by bonds of energy with the visible universe, is also capable of receiving energy from it, and of transforming the energy so received. In fine, it appears to us less likely that by far the larger portion of the high-class energy of the present universe is travelling outwards into space with an immense velocity, than that it is being gradually transferred into an invisible order of things. This last conclusion is, however, more of the nature of a speculation, and is by no means essential to our argument.

199. If we now turn to thought, we find (Art. 59) that, inasmuch as it affects the substance of the present visible universe, it produces a material organ of memory. But the motions which accompany thought must also affect the invisible order of things,

while the forces which cause these motions are likewise derived from the same region, and thus it follows, that '*Thought conceived to affect the matter of another universe simultaneously with this may explain a future state*' (see Anagram, *Nature*, October 15, 1874).

200. This idea, however, requires further development and explanation. Let us therefore begin by supposing that we possess a frame, or the rudiments of a frame, connecting us with the invisible universe, which we may call the spiritual body.

Now each thought we think is accompanied by certain molecular motions and displacements in the brain, and parts of these, let us allow, are in some way stored up in that organ, so as to produce what may be termed our material or physical memory. Other parts of these motions are, however, communicated to the spiritual or invisible body, and are there stored up, forming a memory which may be made use of when that body is free to exercise its functions.

201. Again, one of the arguments (Art. 84) which proves the existence of the invisible universe, demands that it shall be full of energy when the present universe is defunct. We can therefore very well imagine that after death, when the spiritual body is free to exercise its functions, it may be replete with energy, and have eminently the power of action in the present, retaining also, as we have shown above, a hold upon the past, inasmuch as the memory of past events has been stored up in it, and thus preserving the two essential requisites (Art. 61) of a continuous intelligent existence.

202. The conception of an unseen universe is not a new one, even among men of science. The deservedly

famous Dr. Thomas Young has the following passage in his lectures on Natural Philosophy:—'Besides this porosity, there is still room for the supposition, that even the ultimate particles of matter may be permeable to the causes of attractions of various kinds, especially if those causes are immaterial: nor is there anything in the unprejudiced study of physical philosophy that can induce us to doubt the existence of immaterial substances; on the contrary, we see analogies that lead us almost directly to such an opinion. The electrical fluid is supposed to be essentially different from common matter; the general medium of light and heat, according to some, or the principle of caloric, according to others, is equally distinct from it. We see forms of matter, differing in subtility and mobility, under the names of solids, liquids, and gases; above these are the semi-material existences, which produce the phenomena of electricity and magnetism, and either caloric or a universal ether. Higher still, perhaps, are the causes of gravitation, and the immediate agents in attractions of all kinds, which exhibit some phenomena apparently still more remote from all that is compatible with material bodies. And of these different orders of beings, the more refined and immaterial appear to pervade freely the grosser. It seems therefore natural to believe that the analogy may be continued still further, until it rises into existences absolutely immaterial and spiritual. We know not but that thousands of spiritual worlds may exist unseen for ever by human eyes; nor have we any reason to suppose that even the presence of matter, in a given spot, necessarily excludes these existences from it. Those who

maintain that nature always teems with life, wherever living beings can be placed, may therefore speculate with freedom on the possibility of independent worlds; some existing in different parts of space, others pervading each other unseen and unknown, in the same space, and others again to which space may not be a necessary mode of existence.'

203. The only remark which we would make upon this most beautiful and comprehensive passage, with the spirit of which we entirely agree, is, that the author does not use the words *material* and *immaterial* precisely in our sense of these terms. He is inclined to imagine the possibility of an immaterial existence being yet trammelled with regard to space; whereas to our minds such trammels (Art. 54) necessarily constitute matter. If we substitute for *matter* the words *gross matter*, and for *immaterial* the words *not grossly material*, we shall be very nearly at one.

204. It may now be desirable to reply by anticipation to certain objections which are likely to be made to the theory we have proposed. Let us divide these into three categories—religious, theological, and scientific.

Objection First (*Religious*).—It may be said to us, 'Who are you who are wise beyond what is written? Are ye of them to whom it was said of old, "Eritis sicut Deus scientes bonum et malum"? Beware of the words of the great Apostle of the Gentiles:—*Φάσκοντες εἶναι σοφοὶ ἐμωράνθησαν.*'

Reply.—As we have already said (Art 50), we do not write for those who are so assured of the truth of their religion that they are unable to entertain the smallest objection to it. We write for honest in-

quirers—for honest doubters, it may be ;—who desire to know what science, when allowed perfect liberty of thought, and loyally followed, has to say upon those points which so much concern us all. We are content in this work to view the universe from the physical standpoint; you may therefore perchance esteem us of the earth earthy; nevertheless we think that our strength lies in keeping up a communication with those verities which we all acknowledge.

205. *Objection Second* (*Theological*).—Your idea of the spiritual universe is analogous to that of Swedenborg, and we must therefore dismiss it as untrue, inasmuch as we cannot recognise the assumption of the spiritual body until after the resurrection.

Reply.—All that we have done is to remove the scientific objection to a future state, supposed to be furnished by the principle of Continuity. We know nothing about the laws of this state, and conceive it to be quite possible, if otherwise likely, that the spiritual body may remain veiled or in abeyance until the resurrection. We maintain only that we are logically constrained to admit the existence of some frame or organ which is not of this earth, and which survives dissolution—if we regard the principle of Continuity and the doctrine of a future state as both true. Besides, the analogy of Paul, in which the body at death is compared to a seed put into the ground, not only implies some sort of continuity, but also expresses his belief in a present spiritual body. *There is*, says the apostle (observe, not *there shall be*), a spiritual body. Again the same apostle tells us (2 Corinthians v. 1), 'That if our earthly house of this tabernacle were dissolved, we *have* a building of

God, a house not made with hands, eternal in the heavens.'

206. *Objection Third* (*Theological*).—Your argument will apply to the brute creation as well as to man; now we cannot recognise the immortality of the brutes.

Reply.—As before stated, we know nothing about the laws of the invisible universe, except that it is related by bonds of some kind, possibly of energy, to the present. All we have attempted has been to remove an objection to the doctrine of immortality which has been wrongly put forth as scientific, or at least as consistent with scientific knowledge.

207. *Objection Fourth* (*Theological*).—The reasoning you adopt being founded on the law of continuity, seems to imply the development of man's frame from those of the inferior animals, and therefore by implication contradicts the scriptural account of the creation and fall of man.

Reply.—We cannot perceive that our reasoning is in the least degree inconsistent with the account of man's origin given in Scripture. This account implies no doubt a peculiar operation of the invisible universe, but our reasoning compels us to look in this direction for the origin of certain occurrences. Whether the production of man has been the occasion for a peculiar interposition of the unseen it is not within our province to discuss. We can only say that we see no reason from our principles to question the view which asserts that man was made by a peculiar operation out of pre-existent materials.

208. *Objection Fifth* (*Theological*).—The resurrection consistent with your theory could not be a

resurrection of the same particles as were laid in the grave, and in this respect it would be dissimilar to that of Christ.

Reply.—A dissimilarity between the two exists under any theory, for the body of Christ did not experience corruption, while the bodies of believers in Christ are manifestly dissolved by death.

[We make the following suggestion with much hesitation.

What we have to say is founded upon an exceedingly able work by Edward White, entitled *Life in Christ*, which has recently been published, and from which we extract the following passage (page 263):—

'But the Saviour was Divine. As man, identified with human nature, He died, and His death became a sin-offering; as God He could not die. As man He was made "under the law;" as God He was above the law laid on creatures. And therefore, when the curse had taken effect upon the manhood, it was still open to the Divine Inhabitant, absorbing the spirit unto His own essence, to restore the "destroyed Temple" from its ruins; and, taking possession of it, in virtue of his Divinity (not, legally, as a man) "to raise it up on the third day." He arose, therefore, as the Divine Conqueror of death, "God over all, blessed for evermore," and was thus "declared to be the Son of God with power, according to the Spirit of holiness, by *His resurrection* from the dead"—Rom. i. 4. He rose, not "in the likeness of sinful flesh;" not "under the law," but in the character of the "Lord from heaven," "our Lord and our God:"—not in the image of the "son of Adam," but as the "Son of the Highest," having delivered us from wrath by the death of His humanity, to endow us with immortality through the life of His Divinity. He was no longer "the man of sorrows," but The First and The Last and The Living One; no longer crowned with thorns, and clothed in a peasant's robe, but wearing the diadem of the Lord of the Universe, and shining with the supereminent splendours of the Godhead.'

If then Christ died as man, and reanimated his frame in virtue of his divinity, the analogy between Christ, who is the head, and believers, who are His body, will be complete if we suppose that each believer dies as a man, but is raised up by virtue of the divinity of Christ, and inasmuch as the Head is not present here in His glorified bodily form, so it cannot be supposed that His members should at present assume that form.

But when Christ appears again upon earth we are told that His members being raised in what is termed the first resurrection will then accompany Him.

And judging from S. Matthew (chap. xxvii. verse 52), something of this kind, but of a partial nature took place, when Christ locally appeared, after His resurrection, in Jerusalem.

In fine, the true analogy between Christ and the believer should prevent us from supposing that while Christ is absent in His glorified body believers should nevertheless assume theirs.

Now this delay implies the corruption of the believer's body, and renders us unable to believe that the very same particles will be raised again as in the case of Christ. But surely no one can suppose, that if moral and spiritual identity is secured, the mere material particles can be of any consequence.]

209. *Objection Sixth* (*Scientific*).—If there be, as you say, this duality in the present human frame, how can the spiritual part remain latent so long as it does? Even if trammelled by the grosser substance, we might expect that at least on rare occasions it should somehow manifest itself.

Reply.—As a matter of fact we know that ordinary

consciousness can remain latent or inactive for hours, if not for days, and then return to us again. There would be force in this objection if it were not true that consciousness is capable of entering into the dormant or quiescent state.

Again, it is possible that there have been and that there are occasional manifestations of this spiritual nature.

For, in the Christian records visible manifestations of the spiritual element, even in this life, are asserted to have taken place on rare occasions. But if you have dismissed these manifestations as inconceivable, you cannot now bring their absence forward as an objection.

210. *Objection Seventh* (*Scientific*).—Your doctrine of immortality does violence to that great principle, the conservation of energy. For it is manifest that if energy is transferred from the visible into the invisible universe, its constancy in the present universe can no longer be maintained.

Reply.—In reply to this objection we may state that when we assert the conservation of energy it is as a principle applicable to the whole universe, and not to one portion of it, except under special limitations. For instance, it is only by assuming the continual passage through ether of a large portion of the energy of the visible universe that the doctrine as at present held can be maintained. Now the only addition that our theory suggests is the gradual carriage into the invisible universe of some part at least of the energy of gross matter which is associated with thought. But is even this necessary? for this supposes thought to originate through the matter of the visible universe, and then to affect the invisible.

But the reverse order of occurrences is quite as tenable, especially if we suppose with Le Sage that the forces which set in motion the molecules of visible matter are derived from the unseen universe. It may safely be said that our hypothesis is not upset, and never can be upset, by any experimental conclusion with regard to energy.

211. *Objection Eighth* (*Scientific*).—We cannot understand how individuality is to be preserved in the spiritual world.

Reply.—This is no new difficulty. We are as much puzzled by what takes place in our present body as we can be with respect to the spiritual. Thus, let us allow that impressions are stored up in our brains, which thus form an order connecting us with the past of the visible universe. Now thousands, perhaps even millions, of such impressions pass into the same organ, and yet, by the operation of our will, we can concentrate our recollection upon a certain event, and rummage out its details, along with all its collateral circumstances, to the exclusion of everything else. But if the brain or something else plays such a wonderful part in the present economy, is it impossible to imagine that the universe of the future may have even greater individualising powers? Is it not very hazardous to assert this or that mode of existence to be impossible in such a wonderful whole as we feel sure the universe must be?

212. *Objection Ninth* (*Scientific*).—Even if it be allowed that the invisible universe receives energy from the present, so that the conservation of energy holds true as a principle, yet the dissipation of energy must hold true also, and although the process of

decay may be delayed by the storing up of energy in the invisible universe, it cannot be permanently arrested. Ultimately we must believe that every part of the whole universe will be equally supplied with energy, and in consequence all abrupt living motion will come to an end.

Reply.—Perhaps the best reply to this objection is to say that the laws of energy are rather generalisations derived from our experience than scientific principles, like that which we call the *Principle of Continuity*. There would be no permanent confusion of thought introduced if these laws should be found not to hold, or to hold in a different way, in the unseen universe. Nor can we regard the law of the Dissipation as equally fundamental with that of the Conservation of Energy. What is to prove it in the unseen? We have shown (Art. 112) how Clerk-Maxwell's demons (though essentially finite intelligences) could be made to restore energy even in the present universe without spending work. Much more may of course be expected in a universe free from gross matter.

213. *Objection Tenth* (*Quasi-Scientific.*)—You speak of energy being transferred to the unseen, so as to store up for each individual a record of his every thought. You have not shown, as you were bound to do, how such transferred energy could be definitely localised in the unseen.

Reply.—The obligation is entirely the other way. It is you who are bound to show that such localisation is impossible. You quasi-scientific men assert that science disproves all such things. We have shown that Continuity demands an infinite series of develop-

ments. These *may* be either living or dead. But scientific analogy shows that they bear all the marks of intelligent developments. How can there be any doubt or difficulty about our choice under these circumstances? Obviously we cannot accept dead and yet intelligent developments. And although our evidence from analogy may not amount to proof, it is very strong. Yet you objectors virtually assert that you can show its impossibility. Do so, if you can. Give us any proof of the impossibility of an organ connecting us with the unseen universe, or any analogy even apparently against it, and we shall be glad to receive and consider it. We have no doubt that you will thus help us to strengthen our case. You forget that it is you who are the dogmatists—you who assert that these things are incompatible with scientific knowledge, but who, strangely, do not bring forward any proofs of the truth of your assertions.

But in the present case, it so happens that, even with ordinary matter, an infinitely extended medium could be constructed (as Clerk-Maxwell has shown), such that all rays diverging from any point of it whatever shall be brought accurately to a focus at another definite point; every point of space having thus its definite conjugate.

214. Having replied to these objections, let us now endeavour to realise our present position. It is briefly as follows:—What we have done is to show that a future state is possible, and to demolish any so-called scientific objection that might be raised against it. The evidence in favour of the doctrine is not derived from us. It comes to us from two

sources: in the first place, from the statements made concerning Christ; and, in the second place, from that intense longing for immortality which civilised man has invariably possessed. The case stands thus: certain evidence from these two sources in favour of our doctrine has been adduced, but scientific objections have been raised against the possibility of the doctrine itself, and these we have attempted to overcome. But while we may suppose the scientific objections to the doctrine itself surmounted, there yet remains an equally strong scientific objection to that portion of the evidence in favour of the doctrine which is derived from the Christian records. 'Granting,' it may be said to us, 'that immortality is possible, what reason have we, beyond certain vague yearnings, for believing it likely? No doubt, if Christ rose from the dead, the probability in favour of it would be very strong; but we have an objection to the assumed fact of the resurrection of Christ no less formidable than that which you have overcome with regard to the doctrine of immortality itself.'

215. We must now proceed to examine the validity of this objection, and in so doing we find it convenient to approach the problem of the universe not from the side of the future but from that of the past.

We have already (Art. 85) defined the principle of Continuity, in virtue of which we believe ourselves entitled to discuss every event which occurs in the universe, without one single exception, and to deduce from it, if we can, the condition of things that preceded the event—this being also in the universe. We have likewise given reasons for believing that the visible universe must have had a beginning in time,

and it may be desirable to recapitulate these here. In the first place, it is generally allowed by men of science that atoms form the stuff or substance out of which the visible universe is built. Why, then, it is asked by the materialists, cannot we suppose these atoms to be infinite in number, in which case, as far as energy is concerned, we may very well suppose this universe to last from eternity to eternity; and if in addition we may conceive these eternally existing atoms to be in some sense alive, have we not here a hypothesis which will explain the continuous life of the universe as well as its continous energy?

Let us in the meantime reply to the first statement in the hypothesis, reserving that part of it which concerns life for a future occasion (Art. 240).

Our objection to regarding the visible universe as having endured from eternity is threefold. In the first place, this hypothesis, to be tenable, assumes the infinity of the visible universe. This, however, is a pure assumption. We may not be able to prove the contrary, but we perceive no reason why the visible universe should be regarded as infinite. No doubt, if scientific principle imperatively demanded the eternity of the present visible universe, we should be compelled to acknowledge its infinity as a consequence; but we shall see presently that scientific principle leads quite in the opposite direction. So that the weakness of the hypothesis in question is, that while it is contrary to scientific principle it likewise assumes the infinity of the visible universe, which is a pure assumption.

Our second objection is that, in virtue of the principle of Continuity, we are compelled to believe in

the infinite depth of nature, and hold that, just as we must imagine space and duration to be infinite, so must we imagine the structural complexity of the universe to be infinite also. To our minds it appears no less false to pronounce eternal *that aggregation we call the atom*, than it would be to pronounce eternal (Art. 85) *that aggregation we call the sun.* All this follows from the principle of Continuity, in virtue of which we make scientific progress in the knowledge of things, and which leads us, whatever state of things we contemplate, to look for its antecedent in some previous state of things also in the Universe.

Our third objection is that which we have stated in Art. 163. It arises from the belief that the dissipation of the energy of the visible universe proceeds *pari passu* with the aggregation of mass, and therefore that since the large masses of the visible universe are of finite size, we are sure that the process cannot have been going on for ever, or, in other words, the visible universe must have had its origin in time.

216. Let us therefore apply to that stupendous event, the production of the visible universe, not irreverently, but in hopeful trust, the principle of Continuity, and ask ourselves the question, What state of things also in the universe, what conceivable antecedent can have given rise to this unparalleled phenomenon—an antecedent, we need hardly say, which must have operated from the invisible universe? It is a great and awful phenomenon, but we must not shrink before size; we must not be terrified by the magnitude of the event out of reliance upon our principles of discussion.

Now, if we regard the appearance of the visible

universe, and approach it as we would any other phenomenon, we have only two alternatives before us. Creation is not one of these, inasmuch as we are carried by such an act out of the universe altogether. We are, therefore, driven to look to some kind of development as the cause of the appearance of the visible universe. This development may either have been through the living or through the dead; either it was the result of a natural operation of the invisible universe, or it was brought about by means of intelligence residing in that universe and working through its laws. To determine which of these two alternatives is the more admissible, we must bear in mind the nature of the production, and argue about it just as we should argue about anything else.

217. Now, this production was, as far as we can judge, a sporadic or abrupt act, and the substance produced, that is to say the atoms which form the material substratum of the present universe, bear (as Herschel and Clerk-Maxwell have well said) from their uniformity of constitution all the marks of being manufactured articles.

Whether we regard the various elementary atoms as separate productions, or (according to Prout and Lockyer) view them as produced by the coming together of some smaller kind of primordial atom—in either case, and even specially so in the latter case, we think that they look like manufactured articles. Indeed, we have already shown (Art. 164) that development without life, that is to say dead development, does not tend to produce uniformity of structure in the products which it gives rise to.

218. Thus the argument is in favour of the produc-

tion of the visible universe by means of an intelligent agency residing in the invisible universe.

But again let us realise the position in which we are placed by the principle of Continuity—we are led by it not only to regard the invisible universe as having existed before the present one, but the same principle drives us to acknowledge its existence in some form as a universe from all eternity. Now we can readily conceive a universe containing conditioned intelligent beings to have existed before the present; nay, to have existed for a time greater than any assignable time, which is the only way in which our thoughts can approach the eternal. But is it equally easy to conceive a dead universe to have existed in the same way during immeasurable ages? Is a dead universe a fully conditioned universe? For, regarding the laws of the universe as those laws according to which the intelligences of the universe are conditioned by the Governor thereof, can we conceive a dead universe to exist permanently without some being to be conditioned? Is not this something without meaning, an unreality—a make-believe? And if it be said that under these circumstances the conception in any form of immeasurable ages of time is unreal, we may reply by granting it, and asserting that in such a case we are driven not merely from the fully conditioned to the partially conditioned, but even to the unconditioned; in other words, the hypothesis of a permanently dead universe would hardly appear to satisfy the principle of Continuity, which prefers to proceed from one form of the fully conditioned to another. Nor is the difficulty removed by the hypothesis that the matter of the unseen uni-

verse was always in some simple sense alive, and that the motions of its various elements were always accompanied with a very simple species of consciousness, much more simple and rudimentary than any life that we know of here. For to this it may be replied, how is it possible to conceive that life has remained in this rudimentary form through a past eternity, and only developed into intelligence since the production of the visible universe?

219. For the benefit of our readers we shall now endeavour to review as clearly as we can the point at which we have arrived, and the steps which have brought us to it.

It will be remembered that in our definition (Art. 54) we agreed to look upon the Creator—the Absolute One, as conditioning the universe, confining the term universe to that which is conditioned. Thus we conceive a stone to be in the universe, we conceive a man to be in the universe, and to work in it, but we conceive Absolute Deity to be above the universe rather than to work in it in any way analogous to that in which a man works in it. Would there not be a confusion of thought if we regarded the same Person as conditioning and yet conditioned? Now, what the principle of Continuity demands is an endless development of the conditioned. We claim it as the heritage of intelligence that there shall be an endless vista, reaching from eternity to eternity, in each link of which we shall be led only from one form of the conditioned to another, never from the conditioned to the unconditioned or absolute, which would be to us no better than an impenetrable intellectual barrier. It has also been seen that in this

endless chain of conditioned existence we cannot be satisfied with a make-believe universe, or one consisting only of dead matter, but prefer a living intelligent universe, in other words, one fully conditioned. Finally, our argument has led us to regard the production of the visible universe as brought about by an intelligent agency residing in the unseen.

220. We have arrived at this result from general principles, and without any definite theory as to the *modus operandi* of the intelligent developing agency which resides in the unseen universe. When we keep to well-ascertained principles we are on solid ground, but when we speculate on the method by which the development is accomplished we enter a very different region, where the chances are greatly against our particular hypothesis representing the truth. Nevertheless, *for the sake of bringing our ideas in a concrete form before the reader, and for this purpose only*, we will now adopt a definite hypothesis.[1] Let us begin by supposing an intelligent agent in the present visible universe,—that is to say a man—to be developing vortex rings—smoke-rings, let us imagine. Now, these smoke-rings are found to act upon one another, just as if they were things or existences; nevertheless their existence is ephemeral, they last only a few seconds. But let us imagine them to constitute the grossest possible form of material existence. Now, each smoke-ring has in it a multitude of smaller particles of air and smoke, each of these

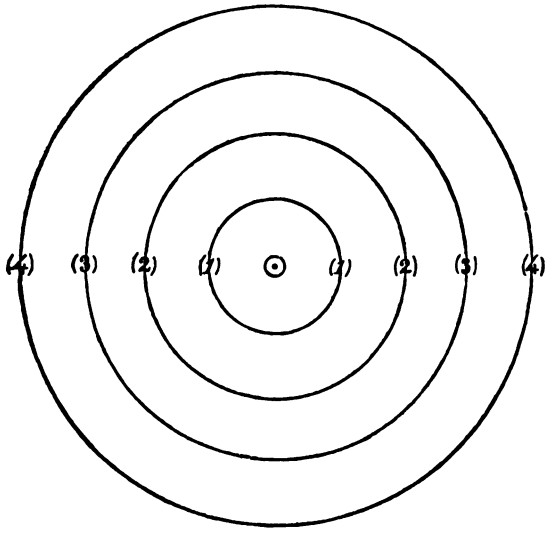
[1] It is surely unnecessary to inform our readers that we adopt this hypothesis, not because we imagine it to have any inherent probability, but simply as a concrete mode of bringing development before the understanding.

particles being the molecules of which the present visible universe is composed. These molecules are of a vastly more refined and delicate organisation than the large smoke-ring; they have lasted many millions of years, and will perhaps last many millions more. Nevertheless, let us imagine that they had a beginning, and that they will also come to an end similar to that of the smoke-ring. In fact, just as the smoke-ring was developed out of ordinary molecules, so let us imagine ordinary molecules to be developed as vortex rings out of something much finer and more subtle than themselves, which we have agreed to call the invisible universe. But we may pursue the same train of thought still further back, and imagine the entities which constitute the invisible universe immediately preceding ours to be in themselves ephemeral, although not nearly to the same extent as the atoms of our universe, and to have been formed in their turn as vortex rings out of some still subtler and more enduring substance. In fine, there is no end to such a process, but we are led on from rank to rank of the order imagined by Dr. Thomas Young, or by Professor Jevons, when he says that 'the smallest particle of solid substance may consist of a vast number of systems united in regular order, each bounded by the other, communicating with it in some manner yet wholly incomprehensible.' Our meaning will be made clear by the following diagram.

Here (0) denotes the evanescent smoke-ring, (1) the visible universe, (2) the invisible universe immediately anterior to the present, (3) that of the next order, and so on.

Again, (0) is developed out of (1); (1) is developed out of (2); (2) out of (3); (3) out of (4), and so on. Further, (1) both precedes and follows (0) in point of duration, while (2) bears a similar relation to (1), (3) to (2), and so on.

Again, the material substance of (0) is a phenomenon of that of (1), that of (1) a phenomenon of



that of (2), and so on. Go back as far as we choose, we are only led from one phenomenon to another; so that, as far as their essential nature is concerned, all are equally phenomenal, and the mind cannot repose in any order as its ultimate haven of thought, but is driven inexorably forward to look for something different.

We see too, that, as far as energy is concerned, that of (1) is greater than that of (0), inasmuch as (1) develops (0), that of (2) greater than that of (1), inasmuch as (2) develops (1), and so on. Therefore, if we go infinitely far back, we shall be led to a universe possessing infinite energy, and of which the intelligent developing agency possesses infinite energy.

It will also be seen that, inasmuch as all these various orders exist together at the present moment, the energy of their sum must be infinite, and this energy will never come to an end. In other words, the Great Whole is infinite in energy, and will last from eternity to eternity.

[If merely to prevent, in future, the possibility of a mistake which has already been made by some of our critics, including even Professor Clifford, it may be well to sketch here very briefly another and quite different concrete illustration of our idea.

Just as points are the terminations of lines, lines the boundaries of surfaces, and surfaces the boundaries of portions of space of three dimensions:—so we may suppose our (essentially three-dimensional) matter to be the mere skin or boundary of an Unseen whose matter has *four* dimensions. And, just as there is a peculiar molecular difference between the surface-film and the rest of a mass of liquid—wherever such a surface-film exists, even in the smallest air-bubble—so the matter of our present universe may be regarded as produced by mere rents or cracks in that of the Unseen. But this may itself consist of four-dimension boundaries of the five-dimensional matter of a higher Unseen, and so on. We might even try

to explain by this how it is that so very little of the nature of definite description of the Unseen is given, even by a learned man like Paul—for the notion of four dimensions would have been totally unintelligible to any one eighteen hundred years ago. And just as he says he heard in the third heaven 'unspeakable words which it is not possible for a man to utter,' so he may have seen things which language was incompetent to describe. But on this hypothesis, as on the former, reflection leads us to the ultimate conception of an infinite series of Universes, each depending on another, and possessing of course among them an infinite store of energy.]

221. Let us here pause for a moment and consider the position into which science has brought us. We are led by scientific logic to an unseen, and by scientific analogy to the spirituality of this unseen. In fine, our conclusion is, that the visible universe has been developed by an intelligence resident in the Unseen.

Of the nature of this intelligent agency we are profoundly ignorant as far as Science is concerned. So far as Science can inform us, it may consist of a multitude of beings, as the Gnostics have supposed, or of one Supreme Intelligence, as is generally believed by the followers of Christ. As scientific men we are absolutely ignorant of the subject. Nor can we easily conceive information to be attainable except by means of some trustworthy communication between the beings resident in the Unseen and ourselves. It is absolutely and utterly hopeless to expect any light on this point from mere scientific reasoning. Can scientific reasoning tell us what kind of life we shall

find in the interior of Africa, or in New Guinea, or at the North Pole, before explorers have been there, and if this be so, is it not utterly absurd to imagine that we can know anything regarding the spiritual inhabitants of the unseen, unless we either go to them or they come to us?

It is therefore of supreme importance for us to know whether there has been any such communication. It would be affectation in us not to say that if there be any such trustworthy communication, we believe it will be found in the Christian records.

It has been said to us by our critics, 'What have you to do with these records?' To this we reply, Not perhaps so much as a professed theologian, but still something.

There is a well-known record, which claims to give us the history of a communication with the spiritual intelligences of the unseen. If true, it must of course teach us many things which science is utterly incompetent to reveal. Nevertheless it is the object of this book to prove that science alone gives us by logic and analogy combined a certain insight into this most interesting and mysterious region. Working our way upwards, we have reached by the principle of Continuity certain regions. Working their way downwards, the Christian records have reached these same regions of thought. Now if our scientific logic be correct, and if the Christian records be trustworthy, we should expect the two accounts of this common region to be consistent with one another.

Let us here therefore inquire what the Christian records say regarding this mysterious, infinitely energetic, intelligent developing agency residing *in* the

universe, and therefore in some sense conditioned, to which we have been led by scientific analogy.

222. These records, as they are interpreted by the majority of the disciples of Christ, are believed to lead to a conception of the Godhead, in which there is a plurality of persons but a unity of substance. It ought, however, to be remembered that here the word *person* does not mean the same thing as it does when applied to ourselves, but only denotes some distinction which may be regarded as best expressed by this word. *Our* idea of person or individual is derived solely from our experience in the position which *we* occupy in the universe.

The first Person in this Trinity, God the Father, is represented as the unapproachable Creator—the Being in virtue of whom all things exist.

Thus it is said (John i. 18), 'No man hath seen God at any time; the only begotten Son which is in the bosom of the Father, he hath declared him.'

Again, Paul tells us (Rom. xi. 36), 'For of him and through him and to him are all things.' Also (1 Cor. viii. 6), 'But to us there is but one God, the Father, of whom are all things, and we to him (εἰς αὐτόν); and one Lord Jesus Christ, by whom are all things, and we by him.'

Also (Eph. iv. 6), 'One God and Father of all, who is above all, and through all, and in all.' Also (1 Timothy vi. 16), 'Who only hath immortality, dwelling in the light which no man can approach unto; whom no man hath seen, nor can see.'

223. Again, of the second Person of the Trinity we are told, in addition to what we gather from the expressions just quoted (John i. 1), 'In the beginning

was the Word, and the Word was with God, and the Word was God. The same was in the beginning with God. All things were made by him, and without him was not any thing made that was made.'

Again (2 Cor. v. 10): 'For we must all appear before the judgment-seat of Christ.'

Again (Col. i. 15): 'Who is the image of the invisible God, the first-born of every creature: for in him were all things created that are in heaven, and that are in earth, visible and invisible, whether they be thrones, or dominions, or principalities, or powers.'

Again (Heb. i. 1): 'God, who at sundry times, and in divers manners, spoke in time past unto the fathers by the prophets, hath in these last days spoken unto us by his Son, whom he hath appointed heir of all things, by whom also he made the worlds.'

224. It is, we believe, a prevalent idea among theologians that these passages indicate, in the first place, the existence of an unapproachable Creator—the unconditioned One who is spoken of as God the Father; and that they also indicate the existence of another Being of the same substance as the Father, but different in person, who has agreed to develop the will of the Father, and thus in some mysterious sense to submit to conditions and to enter into the universe. The relation of this Being to the Father is expressed in Hebrews[1] in the words of the Psalmist, 'Then said I, Lo, I come: in the volume of the book it is written of me, I delight to do thy will, O my God: yea, thy law is within my heart.' In fine, such a Being would represent that conditioned, yet infinitely powerful developing agent, to which the universe,

[1] Heb. x. 7.

objectively considered, appears to lead up. His work is twofold, for, in the first place, he develops the various universes or orders of being; and secondly, in some mysterious way He becomes Himself the type and pattern of each order, the representative of Deity, so far as the beings of that order can comprehend, especially manifesting such divine qualities as could not otherwise be intelligibly presented to their minds.

Such a being is therefore, in virtue of His office, the King of angels and ruler of the invisible universe, and to him the term Lord in the poem of Job is supposed to apply (Job i. 6): 'Now there was a day when the Sons of God came to present themselves before the Lord, and Satan came also among them.'

225. It would thus appear that what may be termed the Christian theory of development has a twofold aspect, a descent and an ascent; the descent of the Son of God through the various grades of existence, and the consequent ascent of the intelligences of each led up by him to a higher level,—a stooping on the part of the developing Being, in order that there may be a mounting up on the part of the developed. Thus it is said (John iii. 16), 'And no man hath ascended up to heaven, but he that came down from heaven, even the Son of man which is in heaven.' Again (Eph. iv. 9): 'Now that he ascended, what is it but that he also descended first into the lower parts of the earth? He that descended is the same also that ascended up far above all heavens, that he might fill all things.'

226. It is naturally in accordance with these views that the Angelic Host should be represented as taking

an intelligent interest, even if they did not, as the Gnostics thought, take an active part, in the creation of the visible universe. Thus the Lord is represented as asking Job (Job xxxviii. 4), 'Where wast thou when I laid the foundations of the earth? declare, if thou hast understanding. Who hath laid the measures thereof, if thou knowest? or who hath stretched the line upon it? Whereupon are the foundations thereof fastened? or who laid the corner-stone thereof, when the morning-stars sang together, and all the sons of God shouted for joy?'

227. It is also in accordance with these views that the same hierarchy should take an intelligent interest in the life of Christ. Thus we read (Luke ii. 13), 'And suddenly there was with the angel a multitude of the heavenly host praising God, and saying, Glory to God in the highest, and on earth peace, good-will toward men.' And again (1 Timothy iii. 16): 'And without controversy great is the mystery of godliness: God was manifest in the flesh, justified in the Spirit, seen of angels, preached unto the Gentiles, believed on in the world, received up into glory.'

228. It will be remarked that the views which we have now put before our readers have been developed more especially from the objective point of view, and that our reasoning has been founded on the principle of Continuity as applied to the outward universe. In truth we seem to get a much firmer and more tangible hold on the objective element of the universe, that is to say, on energy (Art. 103), than we can on intelligence and life. For if we approach our individual consciousness it is very manifest that we have no well-founded principle wherewith to guide our speculations

similar to the principle of Continuity; for this, if we had it, would at once inform us whether the doctrine of immortality is true or false.

We know very well that the universe will remain after we are laid in the grave, but some of us are not equally certain whether we ourselves shall then continue to exist.

Thus there appears to be a difficulty which we see at present no means of surmounting in dealing with individual consciousness. But while the continuance of individual life is enveloped in mystery, it is believed that we have obtained hold of a general principle regarding the distribution of life not greatly inferior in breadth and generality to the law of Continuity. We mean the principle that life proceeds from life, or, to speak more accurately, that a conditioned living thing proceeds only from a conditioned living thing. That dead matter cannot produce a living organism is the universal experience of the most eminent physiologists.[1] In fact, the law of Biogenesis is justly regarded by Professor Huxley and others as the great principle underlying all the phenomena of organised existence

Professor Roscoe, again, approaching the subject from the chemical point of view, says, speaking of red blood corpuscles, 'We have not been able, and the evidence at present rather goes to show that there is not much hope of our being able, to construct these granules artificially; and the question is in this position, that so far as science has progressed at present

[1] See a specially interesting and exhaustive paper by Lister (*Trans. R. S. E.*, 1874-5). A very clear analysis of it is given by Crum Brown (*Proc. R. S. E.*, 1875).

we have not been able to obtain any organism without the intervention of some sort of previously existing germ.'

229. If we assume the truth of this principle it appears to lead us directly to infer that life is not merely a species of energy, or a phenomenon of matter. For we have seen (Art. 103) that the great characteristic of all energy is its transmutability—its Protean power of passing from one form to another. We may no doubt produce large quantities of electricity by means of an electrified nucleus, but we can do the same without any such nucleus—we can make unlimited steel magnets by the help of one piece of loadstone, but we can do this even more effectually by means of a galvanic battery—we may produce fire from a spark, but we can obtain it without a spark.

Life, however, can be produced from life only, and this law would seem to give an indication that the solution of the mystery is not to be found by considering life as merely a species of energy. It is some time since we gave up the idea that life could generate energy; it now seems that we must give up the idea that energy can generate life.

230. In preceding chapters we have given our readers a sketch of the methods according to which men of science imagine that evolution has been carried out in the universe of energy and in that of life. In both worlds the principle of Continuity requires that in endeavouring to account for the origin of phenomena we shall not resort to the hypothesis of separate creations, that we shall not pass over from the conditioned to the unconditioned; and

Darwin, Wallace, and their followers have, as we have shown, endeavoured to prove that processes still pursued by nature are sufficient in a great measure, if not entirely, to account for the present development of organised existence without the necessity of resorting to separate creations. Darwin especially imagines that all the present organisms, including man, may have been derived by the process of natural selection from a single primordial germ. When, however, the backward process has reached this germ, an insuperable difficulty presents itself. How was this germ produced? All really scientific experience tells us that life can be produced from a living antecedent only; what then was the antecedent of this germ? Hypotheses have no doubt been started, but we cannot regard them in any other light than as an acknowledgment of a difficulty which cannot be overcome. We appear to have reached an impenetrable barrier similar to that which stood in our way when we contemplated the production of the visible universe. And precisely as we felt compelled by the logic of scientific process to deal with this first barrier, so we must likewise assert for ourselves with becoming reverence a similar freedom of action in dealing with the second. Therefore, if life be one of the things of the universe, if the assumption of a creation of life in time be inadmissible, and if it be contrary to all experience to allow the possibility of the production of life from antecedents not possessing life, we are entitled, even in such a case as the present, to make use of this conclusion derived from experience, and are thus forced to contemplate an antecedent possessing life and giving life to this primordial

germ,—an antecedent in the universe, not out of it,—conditioned, not unconditioned. Now, what is the meaning of this conclusion? In the first place, it does not mean that the antecedent to the primordial germ must be a like germ, for we know from experience that while life is always produced from life, like is by no means always produced from like. In this case more especially the living antecedent must be in the invisible universe, and therefore altogether different from the germ.

231. If we now turn once more to the Christian system, we find that it recognises such an antecedent as an agent in the universe. He is styled the Lord, and Giver of Life. The third Person of the Trinity is regarded in this system as working in the universe, and therefore in some sense as conditioned. One of His functions consists in distributing and developing this principle of life, which we are forced to regard as one of the things of the universe; just as the second Person of the Trinity is regarded as developing those other phenomena, the matter and energy of the universe. The one has entered from everlasting into the universe, in order to develop its objective elements, matter and energy; the other has also entered from everlasting into the universe, in order to develop its subjective element, life.

Thus we read (Gen. i. 2), 'And the earth was without form, and void; and darkness was upon the face of the deep: and the Spirit of God moved upon the face of the waters;' implying, we may imagine, a peculiar operation of this Spirit preceding the advent of life into the world. Again, when in the fulness of time, Christ, the developing agent, made

His appearance here, and submitted to the trammels of a human nature, this appearance was preceded by an operation of the same Spirit.

232. It may here be desirable to discuss somewhat fully the position of life in the universe, as we are constrained to view it in virtue of the scientifically established principles of biogenesis.

If then the matter of this present visible universe be not capable of itself, that is to say, in virtue of the forces and qualities with which it has been endowed, of generating life; but if we must look to the unseen universe for the origin of life, this would appear to show that the peculiar collocation of matter which accompanies the operations of life is not a mere grouping of particles of the visible universe, but implies likewise some peculiarity in the connection of these with the unseen universe. May it not denote in fact some peculiarity of structure extending to the unseen?

In fine, to go a step further, may not life denote a peculiarity of structure which is handed over not merely from one stage to another—from the invisible to the visible—but which rises upwards from the very lowest structural depths of the material of the universe, this material being regarded as possessed of an infinitely complex structure such as we have pictured to our readers in a previous part of this chapter (Art. 220).

If we suppose any such peculiarity to accompany life we cannot fail at once to see the impossibility of its originating in the visible universe alone.

233. Again, it is well known to many of our readers that discussions have frequently arisen regarding the

peculiar place and function of life in the universe. What is its relation to energy? it certainly does not create energy—what then does it do?

One way of replying to this question is indicated in the following passage, which we quote at length from an article on 'The Atomic Theory of Lucretius,' in the *North British Review* for March 1868 :—

'It is a principle of mechanics that a force acting at right angles to the direction in which a body is moving does no work, although it may continually and continuously alter the direction in which the body moves. No power, no energy, is required to deflect a bullet from its path, provided the deflecting force acts always at right angles to that path. . . .

'If you believe in free-will and in atoms, you have two courses open to you. The first alternative may be put as follows : Something which is not atoms must be allowed an existence, and must be supposed capable of acting on the atoms. The atoms may, as Democritus believed, build up a huge mechanical structure, each wheel of which drives its neighbour in one long inevitable sequence of causation ; but you may assume that beyond this ever-grinding wheelwork there exists a power not subject to but partly master of the machine ; you may believe that man possesses such a power, and if so, no better conception of the manner of its action could be devised than the idea of its deflecting the atoms in their onward path to the right or left of that line in which they would naturally move. The will, if it so acted, would add nothing sensible to nor take anything sensible from the energy of the universe. The modern believer in free-will will probably adopt this view, which is certainly consistent with observation, although not proved by it. Such a power of moulding circumstances, of turning the torrent to the right, where it shall fertilise, or to the left, where it shall overwhelm, but in nowise of arresting the torrent, adding nothing to it, taking nothing from it,—such is precisely the apparent action of man's will ; and though we must allow that possibly the deflecting action does but result from some smaller subtler stream of circumstance, yet if we may trust to our direct per-

ception of free-will, the above theory, involving a power in man beyond that of atoms, would probably be our choice. . . .

'We cannot hope that natural science will ever lend the least assistance towards answering the Free-will and Necessity question. The doctrines of the indestructibility of matter and of the conservation of energy seem at first sight to help the Necessitarians, for they might argue that if free-will acts it must add something to or take something from the physical universe, and if experiment shows that nothing of the kind occurs, away goes free-will; but this argument is worthless, for if mind or will simply deflects matter as it moves, it may produce all the consequences claimed by the Wilful school, and yet it will neither add energy nor matter to the universe.'

234. Now there appears to us to be a very serious objection to this mode of regarding the position of life, unless it be somewhat modified. Let us take one of the visible masses of this present universe, such as a planet. Suppose for a moment that instead of being attracted to a fixed and visible centre of force such as the sun, it is bound to an invisible and vagrant centre, the only condition imposed upon whose irregularities is that it shall always move in such a manner that there shall be neither creation nor destruction of energy.

We have only to imagine for a moment such a universe in order to realise the inextricable confusion into which its intelligent inhabitants would be plunged by the operation of a viewless and unaccountable agency of this nature. No doubt the hypothesis regarding life, which we have quoted above, limits this mode of action to the molecular motions of matter, but if our line of argument has been followed throughout, the reader will probably acknowledge that the superior intelligences of the universe may

have the same appretiation of molecular motions that we have of those of large masses. Now they would in turn be put to inextricable confusion by the advent of an unperceivable, and, from the nature of the case, irresponsible force entitled *will* operating towards the deflection of these molecular motions, even although the energy of the universe should remain the same. We think that Professor Huxley and some others who have opposed this mode of regarding the position of life have been somewhat unjustly blamed. They have driven the operation of the mystery called life or will out of the objective universe, out of that portion of things which is capable of being scientifically studied by intelligence, and in so doing they have most assuredly done right. The mistake made (whether by this party or by their adversaries) lies in imagining that by such a process they completely get rid of a thing so driven before them, and that it thus disappears from the universe altogether. It does no such thing. It merely disappears from that small circle of light which we may call the universe of scientific perception.

But the greater the circle of light (to adopt the words of Dr. Chalmers), the greater the circumference of darkness, and the mystery which has been driven before us looms in the darkness that surrounds this circle, growing more mysterious and more tremendous as the circumference is increased. In fine, we have already remarked that the position of the scientific man is to clear a space before him from which all mystery shall be driven away, and in which there shall be nothing but matter and energy subject to certain definite laws which he can comprehend. There are

however three great mysteries (a trinity of mysteries) which elude, and will for ever elude, his grasp, and these will persistently hover around the border of this cleared and illuminated circle,—they are the mystery of matter and energy; the mystery of life and mind; and the mystery of God,—and these three are one.

235. But in this latter statement we have transgressed the limits of our inquiry, and are content to be driven back. Suffice it to say that these three gigantic mysteries will persistently hover around the illuminated circle, or, to speak more properly, the illuminated sphere of scientific thought, of which duration, extension, and structural complexity may be regarded as the three independent co-ordinates in terms of each of which the process of development goes on simultaneously as the boundary of the sphere is enlarged.

Within this sphere we have only that which can be grasped by Physical Science, but we are not therefore to infer that matter and the laws of matter have a reality and a permanence denied to intelligence.

It is rather because they are at the bottom of the list—are in fact the simplest and lowest of the three—that they are capable of being most readily grasped by the finite intelligences of the universe. The following words of Professor Stokes, in his presidential address to the British Association at Exeter, occur to us as very clearly embodying this thought:—

'Admitting to the full as highly probable, though not completely demonstrated, the applicability to living beings of the laws which have been ascertained with reference to dead matter, I feel constrained at the same time to admit the existence of a mysterious *something* lying beyond, a something *sui generis*,

which I regard, not as balancing and suspending the ordinary physical laws, but as working with them and through them to the attainment of a designed end. What this *something* which we call life may be is a profound mystery. . . . When from the phenomena of life we pass on to those of mind, we enter a region still more profoundly mysterious. We can readily imagine that we *may* here be dealing with phenomena altogether transcending those of mere life, in some such way as those of life transcend, as I have endeavoured to infer, those of chemistry and molecular attractions, or as the laws of chemical affinity in their turn transcend those of mere mechanics. Science can be expected to do but little to aid us here, since the instrument of research is itself the object of investigation. It can but enlighten us as to the depths of our ignorance, and lead us to look to a higher aid for that which most nearly concerns our well-being.'

236. In fine, the physical properties of matter form the alphabet which is put into our hands by God, the study of which will, if properly conducted, enable us more perfectly to read that Great Book which we call the Universe.

We have begun to recognise some of the chief letters of this alphabet, and even to put them two and two together; and, like an intelligent but somewhat conceited child, we are very proud of our achievement. Like such a child we have not yet, however, completely grasped the fact that these letters are only symbols, but look upon them with intense awe as the great thing in the world, meaning of course our world. We look with a sort of adoration towards those pages in which there are words of two syllables, and are ready to fall down at the feet of that older and wiser child who has penetrated into the depths of such profound mysteries. Our belief is that all knowledge is made for the alphabet just as

the little musician believes that all music is made for the piano.

237. Life, then, whatever be its nature, may be supposed to penetrate into the structural depths of the universe. Its seat is in a region inaccessible to human inquiry, and equally inaccessible, we may well suppose, to the inquiries of the higher created intelligences. Intimations of its presence are no doubt constantly emerging from this region of thick darkness into the objective universe, but when they have reached it they obey the ordinary laws of phenomena, according to which a material effect implies a material antecedent.

Notwithstanding all this, life exists just as surely as the Deity exists. For we have subjected both these mysteries to the same process, and have found it as difficult to rid ourselves of the one as of the other.

We have driven the creative operation of the Great First Cause into the durational depths of the universe, —into the eternity of the past,—but for all that we have not got rid of God. In like manner we have driven the mystery of life into the structural depths of the universe,—that region of thick darkness which no created eye is able to pierce,—but we have not got rid of life, nor are we likely to do so. Before concluding this digression upon the place of life, let us briefly review the attempts made to account for the origin of life by those who have yet fallen short of the scientific conception of an Unseen Universe.

238. Sir W. Thomson has gone further than any one else in such inquiries. We have already alluded

to his attempt to explain the origin of the material universe by the vortex-ring hypothesis, and also to his other attempt to explain gravitation by the modification of the hypothesis of ultramundane corpuscles. If we add to these his attempt to explain the origin of life as consistently as possible with the principle of Continuity, we think it must be acknowledged that he is a true pioneer in such inquiries as those of this volume as well as in the more ordinary branches of Physical Science.

The explanation of the origin of life proposed by Sir W. Thomson had also occurred independently to Professor Helmholtz. This latter physicist, in an article on the use and abuse of the deductive method in Physical Science,[1] tells us very clearly what led himself, and no doubt Sir W. Thomson likewise, to suggest the meteoric hypothesis as a possible way of accounting for the origin of terrestrial life:—'If failure attends all our efforts to obtain a generation of organisms from lifeless matter, it seems to me (says Professor Helmholtz) a thoroughly correct procedure to inquire whether there has ever been an origination of life, or whether it is not as old as matter, and whether its germs, borne from one world to another, have not been developed wherever they have found a favourable soil.'

239. We have already sufficiently pointed out that the man of science objects to separate creations, and that, in consequence, he tries to explain the present terrestrial life by means of a single primordial germ. But the difficulty still remains regarding the original appearance of this germ.

[1] *Nature*, January 14, 1875

Now, according to the meteoric hypothesis, this germ may have been wafted to us from some other world, or its fragments, and thus one act of creation of life might possibly serve for many worlds. If therefore this hypothesis were otherwise tenable it would diminish the difficulty implied by separate creations, but would it entirely remove it? We doubt this very much.

For, in the first place, as far as we can judge (Art. 163) the visible universe—the universe of worlds—is not eternal, while however the invisible universe, or that which we may for illustration at least associate with the ethereal medium, is necessarily eternal. The visible universe must have had its origin in time (Art. 116), no doubt from a nebulous condition. But in this condition it can hardly have been fit for the reception of life. Life must therefore have been created afterwards. We have thus at least two separate creations, both taking place in time—the one of matter and the other of life. And even if it were possible, which it is not, to get over one of the difficulties attending this hypothesis, that of creation in time, by regarding the visible universe as eternal; yet even then we must regard matter and life as implying two separate creative acts if we assume the nebulous hypothesis to be true. For if x denote the date of the advent of life, and $x+a$ that of the advent of matter, a being a constant quantity, the two operations cannot be made simultaneous by merely increasing the value of x without limit. Now this is what we mean by eternity, and therefore we cannot help thinking that this want of simultaneity implies a defect in this mode of viewing the origin of things.

240. Yet another hypothesis has been produced, which starts with the assumption that all matter is in some simple sense alive. Looking upon the atom as the essential thing in the universe, the various motions of the atom are by this school supposed to be accompanied by a species of consciousness inconceivably simple. Under certain circumstances this eternal and immortal consciousness is supposed to be consistent with that which we call the life of the individual, while under other circumstances these two lives are not consistent with one another. The individual then dies, but nevertheless the simple immortal lives of the atoms which compose his body remain attached to them as truly as before.

There is no disappearance of anything from the universe, only the mode in which the simple immortal life becomes manifested has undergone a change of expression, just as energy may be supposed to undergo a change without disappearing. It is thought by the members of this school that such a hypothesis satisfies the Principle of Continuity more fully than any other. For, looking at things from the old point of view, we see that certain atoms are concerned in the manifestation of consciousness, as for instance the particles of our brains, while certain other atoms are not so concerned, as for instance the inorganic matter we see around us.

Here then, it is argued, we have a breach of the Principle of Continuity, inasmuch as certain things of the universe (brain particles) have a function assigned to them in their association with consciousness, which other things (gold, silver, etc.) do not possess in any measure, if the distinction between organic and inor-

ganic be an essential one. To avert this breach, it is essential that all matter should be considered as in some sense alive. It is furthermore argued, that by this hypothesis there is no difficulty in accounting for the introduction of life, inasmuch as life always accompanies matter, the mode of manifestation of the one being regulated by the mode of collocation of the other.

241. Now it appears to us that this school of thought are justified in declining to accept a hypothesis which attributes to certain substances of the universe a power which is entirely wanting in others, or that gives to the same substance at one time a fundamental power or property that is entirely wanting at another. It is not so much the premiss as the conclusion of this school to which we object. For let us consider for a moment what is implied in the astounding inference that the atom is the true abode of immortal life in the universe, and that its life is of an extremely simple kind.

It implies, in the first place, that the atom is eternal, and to this we object. It implies, in the next place, that the atom is extremely simple in its constitution, and to this we object. It implies, thirdly, that for the antecedents of the motions of the atom it is unnecessary to resort to anything beyond the atom itself, and to this we object.

242. We have in other places sufficiently set forth our objection to regarding the atom either as eternal or as extremely simple in constitution, let us now state our objection to regarding the motions of the atom (in this generalisation) apart from the surrounding universe.

Our objection is, that in order to conceive the nature of the forces by which atoms act upon each other, we are driven at once, if not to the very hypothesis of Le Sage, at least to something which implies the existence and agency of the Unseen Universe.

But when once we have taken this step, we are not permitted to rest, for another journey is before us, and after that another, and so on. In fine, there is no end to the process, and no halting-place for the mind, except in the belief that the universe as a whole participates in every motion which takes place even in the smallest of atoms.[1]

Undoubtedly as regards certain practical scientific results, it is allowable to regard the atom as a thing by itself, and to sum up the *apparent* actions of the various atoms as if each were independent of everything else. But when we come to a generalisation so fundamental as this hypothesis regarding life, we are forced to ask whether the apparent and visible action of atoms on one another is really everything which takes place, and then we find, as we have just shown, that we are driven at once into the Unseen Universe, and thence into an endless complexity of antecedent.

In fine, we conclude that inasmuch as the universe in its various orders participates in every conceivable motion, the consciousness which accompanies this motion cannot logically be confined to the apparently moving body or atom, but must in some sense extend to the Unseen Universe in its various orders. But

[1] The Rev. James Martineau has, we perceive, taken up a similar line of argument. (See Art. on 'Modern Materialism,' *Contemporary Review*, February 1876.)

this is only another way of expressing the conclusions at which we have already arrived, for (of course) if we imagine a Divine Agency to be resident in the universe, we cannot but suppose that every motion of any kind is accompanied with a consciousness of this Divine Agency.

In fine, we maintain that *what we are driven to is not an under-life resident in the atom, but rather*, to adopt the words of a recent writer, *a Divine over-life in which we live and move and have our being.*

243. Here it is desirable to consider what we gain by this hypothesis. Our gain is simply in the way in which we regard the functions of matter, and a little reflection will convince us that neither form of this hypothesis, whether we hold by an under or an over life, will enable us to explain the introduction of life into the visible universe by natural laws alone, and without resorting to some peculiar action of the unseen. As a matter of fact we are led by science to receive the law of Biogenesis as expressing the present order of the world. But the introduction of life into the world does not become more consistent with this law by virtue of an hypothesis which associates a consciousness of some sort with every motion of the universe.

It still remains a fact as much as ever, that there is a marked distinction between the living and the dead—the organic and the inorganic. And it still remains true that, as a matter of universal scientific experience, a living thing can only be produced from a living thing, and that the inorganic forces of the visible universe can by no means generate life.

In fine, our hypothesis, in which the material as well as the life of the visible universe are regarded as having been developed from the Unseen, in which they had existed from Eternity, appears to us to present the only available method of avoiding a break of continuity, if at the same time we are to accept loyally the indications given by observation and experiment. It may be said (just as anything else may be said) that the visible universe is eternal, and that it has the power of originating life; but both statements are surely opposed to the results of observation and experiment. Now we must be content in such matters as these to be guided by probabilities, and it certainly appears most probable that the visible universe is *not* eternal, and that it has *not* the power of originating life. In fine, life as well as matter comes to us from the Unseen Universe.

244. Let us here again pause for a moment and review the position which we have reached. By taking the universe as we find it, and regarding each occurrence in it, without exception, as something upon which it was meant that we should exercise our intellects, we are led at once to the principle of Continuity, which asserts that we shall never be carried from the conditioned to the unconditioned, but only from one order of the fully conditioned to another. Two great laws come before us: the one of which is the Conservation of Mass and of Energy; that is to say, conservation of the objective element of the universe; while the other is the law of Biogenesis, in virtue of which the appearance of a living Being in the universe denotes the existence of an antecedent possessing life. We are led from these

two great laws, as well as from the principle of Continuity, to regard, as at least the most probable solution, that there is an intelligent Agent operating in the universe, one of whose functions it is to develop energy; and also that there is an intelligent Agent, one of whose functions it is to develop life. Perhaps we ought rather to say that, if we are not driven to this very conclusion, it appears at least to be that which most simply and naturally satisfies the principle of Continuity.

But this conclusion hardly differs from the Christian doctrine; or, to speak properly, the conclusion, so far as it goes, appears to agree with the Christian doctrine.

In fine, we are led to regard it as one of the great merits of the Christian system, that its doctrine is pre-eminently one of intellectual liberty, and that while theologians on the one hand, and men of science on the other, have each erected their barriers to inquiry, the early Christian records acknowledge no such barrier, but on the contrary assert the most perfect freedom for all the powers of man.

245. We have now reached a stage from which we can very easily dispose of any scientific difficulty regarding miracles. For if the invisible was able to produce the present visible universe with all its energy, it could of course, *a fortiori*, very easily produce such transmutations of energy from the one universe into the other as would account for the events which took place in Judea. Those events are therefore no longer to be regarded as absolute breaks of continuity, a thing which we have agreed to consider impossible, but only as the result of a peculiar action of the invisible upon the visible universe.

When we dig up an ant-hill, we perform an operation which, to the inhabitants of the hill, is mysteriously perplexing, far transcending their experience, but *we* know very well that the whole affair happens without any breach of continuity of the laws of the universe. In like manner, the scientific difficulty with regard to miracles will, we think, entirely disappear, if our view of the invisible universe be accepted, or indeed if any view be accepted which implies the presence in it of living beings much more powerful than ourselves. It is of course assumed that the visible and invisible are and have been constantly in a state of intimate mutual relation.

246. We have as yet only replied to the scientific objection, but there are other objections which might be raised. Thus, for instance, it might be said, What occasion was there for the interference implied in miracles? And again, Is the historical testimony in favour of their occurrence conclusive? We must leave the last objection to be replied to by the historian; but with respect to the former, it appears to us as almost self-evident that Christ, if He came to us from the invisible world, could hardly (with reverence be it spoken) have done so without some peculiar sort of communication being established between the two worlds. No doubt we may well imagine that the acts of interference in virtue of this communication were strictly limited; and in proof of this conclusion we may cite the fact that what did occur was sufficiently startling to have secured the ear of humanity ever since, but not sufficiently overwhelming to preclude the exercise of individual faith. The very fact of there being sincere sceptics proves, we think, the

limited extent of these interferences.[1] And we must remember, on the other hand, that it is quite possible to accept fully the truth of a statement without the slightest influence resulting as regards modification of our course of action. Perhaps the most terrible portion of the New Testament is the passage (James ii. 19), 'the demons also believe, and tremble.'

247. We have now considered miracles, or those apparent breaks of continuity which have been furnished by history, but our readers are already well aware that equally formidable breaks are brought before us by science. There is, to begin with, that formidable phenomenon, the production in time of the visible universe. Secondly, there is a break hardly less formidable, the original production of life; and there is, thirdly, that break recognised by Wallace and his school of natural history, which seems to have occurred at the first production of man. Greatly as we are indebted to Darwin, Huxley, and those who have prominently advocated the possibility of the present system of things' having been developed by forces and operations such as we see before us, it must be regarded by us, and we think it is regarded by them, as a defect in their system, that these breaks remain unaccounted for. Our readers will now, however, if we mistake not, perceive what is the real source of the perplexity felt by the school of evolutionists. It is that they have been unable to regard an interference of the invisible universe in any other light than as an absolute break of continuity; and holding with justice to the principle of continuity,

[1] See Sermon preached at Belfast by Dr. Reichel, August 23, 1874.

they have been unable to do more than acknowledge these difficulties and allow them to remain.

But from our point of view these difficulties are by no means impenetrable barriers, barring for ever the progress of research. On the contrary, we assert that, if approached with sufficient boldness, and examined with sufficient care, they will be found to contain avenues leading up to the invisible universe, and directing our inquiries thitherwards. There may be possibly other apparent breaks or barriers, but these appear to be the best established; and, with these exceptions, we may suppose that the visible universe, in so far as we are capable of investigating it, has been left to develop itself in accordance with those laws of energy which we see in operation at the present day.

In fine, the visible universe was plainly intended to be something which we are capable of investigating, and the few apparent breaks are in reality so many partially concealed avenues leading up to the unseen.

248. Our readers must not however infer from what we have now said, that we do not recognise any present points of contact between us and the invisible. There may possibly be (but even of this we are not quite sure) no points of *apparent interference* between the two, so that the man of science cannot say,—Here is a break;—but nevertheless there may be *a close and vital union* between the two universes, in those regions into which investigation cannot penetrate, and who shall say that the laws of these regions do not admit of the objective efficacy of prayer? There may be an action of the invisible world upon the individual mind, and there is no reason why there

should not also be an action upon the visible universe, by means of those processes of delicacy which, as we have already seen, obtain in that quarter (Art. 184). Neither the one action nor the other would be detected by science, unless we except certain providential occurrences, which are generally, however, better recognised by the individuals to whom they refer than by the world at large. And just as reversibility (Art. 113) is the stamp of perfection in the inanimate engine, so a similar reversibility may be the stamp of perfection in the living man. He ought to live for the unseen—to carry into it something which may not be wholly unacceptable. But, in order to enable him to do this, the unseen must also work upon him, and its influences must pervade his spiritual nature. Thus a life *for* the unseen *through* the unseen is to be regarded as the only perfect life.

249. In fine, the unseen may have a very wide field of influence, but from its very nature its working is not discernible, or at least easily discernible, by the eye of sense, and we are therefore led to consult the Christian records for otherwise unattainable information regarding the reality of a present influence exercised by the invisible universe upon ours.

In the first place, we have the following words of Christ himself (Matt. xiii. 41): 'The Son of man shall send forth his angels, and they shall gather out of his kingdom all things that offend, and them which do iniquity, and shall cast them into a furnace of fire: there shall be wailing and gnashing of teeth.' Again (Matt. xxv. 31): 'When the Son of man shall come in his glory, and all the holy angels with him, then shall he sit upon the throne of his glory: and before

him shall be gathered all nations; and he shall separate them one from another, as a shepherd divideth his sheep from the goats.' Again (Matt. xxvi. 53), speaking to Peter: 'Thinkest thou that I cannot now pray to my Father, and he shall presently give me more than twelve legions of angels?' Furthermore, we read (Heb. i. 14): 'Are they not all ministering spirits, sent forth to minister for them who shall be heirs of salvation?'

These passages (and many more might be quoted) would appear to show that, according to the Scriptures, the angels take a very prominent part in the administration of the universe under the direction of the Son of God. They are his ministers, his messengers, who execute his decrees and perform his errands, whether of mercy or of justice. Therefore it is said of Christ, 'Thou art the King of angels;' and of himself in his glorified state, speaking to his disciples, Christ says (Matt. xxviii. 18): 'All power is given unto me in heaven and in earth. Go ye therefore, and teach all nations, baptising them in the name of the Father, and of the Son, and of the Holy Ghost, teaching them to observe all things whatsoever I have commanded you; and, lo, I am with you alway, even unto the end of the world.'

Let us close these quotations by one from the Old Testament—2 Kings vi. 15-17: 'And when the servant of the man of God was risen early, and gone forth, behold, an host encompassed the city both with horses and chariots: and his servant said unto him, Alas, my master! how shall we do? And he answered, Fear not; for they that be with us are more than they that be with them. And Elisha prayed, and

said, Lord, I pray thee, open his eyes, that he may see. And the Lord opened the eyes of the young man: and he saw: and, behold, the mountain was full of horses and chariots of fire round about Elisha.'

Finally, it is the belief of a large portion of the Christian Church that the Spirit of God dwells in and acts upon the souls of believers. This action represents the influence which reaches the soul of man *from* the unseen, enabling him to live *for* the unseen.

250. We have in our opening chapter quoted a very remarkable passage from Swedenborg upon the particular nature of God's providence. Let us now hear what the Scriptures say upon the same subject. Christ tells us (Luke xii. 6): 'Are not five sparrows sold for two farthings, and not one of them is forgotten before God? But even the very hairs of your head are all numbered. Fear not therefore: ye are of more value than many sparrows.' Again, St. Paul tells us (Rom. viii. 28): 'And we know that all things work together for good to them that love God, to them who are called according to his purpose.' Also (Rom. viii. 38): 'For I am persuaded, that neither death, nor life, nor angels, nor principalities, nor powers, nor things present, nor things to come, nor height, nor depth, nor any other creature, shall be able to separate us from the love of God, which is in Christ Jesus our Lord.'

251. We think it may be concluded from all these passages that the doctrine of a particular providence is taught in the Scriptures. Nevertheless it is one of the hardest things to understand how this doctrine can be made consistent with the working out of general laws which, so far as we can study them,

appear to have no reference whatever to individuals. This was a difficulty intensely felt by the late John Stuart Mill. He says, in a work published after his death :—

'For how stands the fact? That, next to the greatness of these cosmic forces, the quality which most forcibly strikes every one who does not avert his eyes from it is their perfect and absolute recklessness. They go straight to their end without regarding what or whom they crush on the road. Optimists, in their attempts to prove that "whatever is, is right," are obliged to maintain, not that Nature ever turns one step from her path to avoid trampling us into destruction, but that it would be very unreasonable in us to expect that she should. Pope's "Shall gravitation cease when you go by?" may be a just rebuke to any one who should be so silly as to expect common human morality from Nature. But if the question were between two men, instead of between a man and a natural phenomenon, that triumphant apostrophe would be thought a rare piece of impudence. A man who should persist in hurling stones or firing cannon when another man "goes by," and, having killed him, should urge a similar plea in exculpation, would very deservedly be found guilty of murder. In sober truth, nearly all the things which men are hanged or imprisoned for doing to one another are Nature's every-day performances.'

This objection to belief in the reality of the government of God has been clothed in very eloquent language in a sermon by the Rev. James Martineau : —'The battle of existence' (he tells us, putting himself for the moment into the position of Mill and his school) 'rages through all time and in every field ; and its rule is to give no quarter—to despatch the maimed, to overtake the halt, to trip up the blind, and drive the fugitive host over the precipice into the sea.'

In very beautiful language the poet Tennyson, after proposing the same riddle, replies to it thus :—

'Are God and Nature then at strife
That Nature lends such evil dreams?
So careful of the type she seems,
So careless of the single life;

. . . . .

"So careful of the type"? but no.
From scarped cliff and quarried stone
She cries, A thousand types are gone:
I care for nothing: all shall go.

. . . . .

O life as futile, then, as frail!
O for thy voice to soothe and bless!
What hope of answer or redress?
Behind the veil, behind the veil.'

In another passage of equal beauty the same poet expresses his conviction

'That nothing walks with aimless feet:
That not one life shall be destroy'd
Or cast as rubbish to the void,
When God hath made the pile complete.

That not a worm is cloven in vain;
That not a moth with vain desire
Is shrivel'd in a fruitless fire,
Or but subserves another's gain.'

Professor Jevons, again, in his *Principles of Science* (vol. ii. p. 468) alludes in the following terms to this difficulty:—'The hypothesis, that there is a Creator, at once all-powerful and all-benevolent, is surrounded, as it must seem to every candid investigator, with difficulties verging closely upon logical contradiction. The existence of the smallest amount of pain and evil would seem to show that He is either not perfectly benevolent, or not all-powerful. No one can have lived long without experiencing

which the significance is inexplicable. But if we cannot succeed in avoiding contradiction in our notions of elementary geometry, can we expect that the ultimate purposes of existence shall present themselves to us with perfect clearness? I can see nothing to forbid the notion that in a higher state of intelligence much that is now obscure may become clear. We perpetually find ourselves in the position of finite minds attempting infinite problems, and can we be sure that where we see contradiction an infinite intelligence might not discover perfect logical harmony?'

252. Before we leave this subject there is one consideration which ought not to be forgotten. It is evident that the development of the visible universe is of such a nature that we can understand it, and to a great extent explain it by means of laws and processes with which we are familiar: nay, the order of the universe is something which it is our very duty to investigate. But the result of our inquiry is, and can only be, the appretiation of general laws of action. The working out of these laws can have, from this point of view, no possible reference to individual interests. If gravity acted sometimes, and at other times refrained from acting, we could derive no certain information from our experience; we could not advance in art or science, and should infallibly be plunged into speedy confusion. Nevertheless, it is not impossible that the occurrences which take place through the action of gravity may, after all, be so arranged as to have reference to the real welfare of individuals, although this reference may not be apparent because we are not in a position to recognise it, and it is not intended that we should do so, at least

in this life. The ability to do so would be a very dangerous gift, and would go far to upset the present economy. We know very little about the bearings of events on our own best interests, and nothing at all about their bearings on those of our neighbour. We may, however, believe with Jevons, that in a future state the adaptation between the two may become apparent to us, even if we do not ourselves become instruments in bringing this adaptation about.

253. The outcome of all these speculations would thus lead us to regard the Christian system as affording a full scope for development in all respects, whether of the universe or of the individual. Its law is pre-eminently that of liberty, and it has conducted us to the conclusion that the doctrine of the Trinity, or something analogous to it, forms, as it were, the avenue through which the universe itself leads us up to the conception of the infinite and eternal One.

Nevertheless, not a few of our readers may be disinclined to entertain any precise conception of the divine nature. Neither atheists nor theists, they simply dismiss the Deity as being quite above their comprehension, and all doctrines founded upon definite conceptions of the Deity, as superstructures without foundation.

Now, the results regarding a future state at which we have arrived are, as we think, and as we have said in our introduction, capable of being very nearly, if not altogether, detached from all conceptions regarding the Divine essence.

We have merely to take the universe as it is, and, adopting the principle of Continuity, insist upon an endless chain of events, all fully conditioned, however

far we go either backwards or forwards. This process leads us at once to the conception of an invisible universe, and to see that immortality is possible without a break of continuity.

We have, however, no physical proof in favour of it, unless we allow that Christ rose from the dead. But it will be admitted that, if Christ rose from the dead, a future state becomes more than possible; it becomes probable; and we do not see that this conclusion is, in itself, greatly modified by differences in our mode of regarding the exact nature of Christ.

Again, the production of the visible universe in time leads us, by the principle of Continuity, to the conception of a fully conditioned intelligent universe, existing prior to the production of the visible. And furthermore, we are induced by our argument (Art. 218) to regard the production of the visible universe as the work of an intelligent agency residing in the invisible. If, then, such an agency could produce the visible universe, it could certainly accomplish the resurrection of Christ, without any break of continuity, so far as the whole universe is concerned.

254. The joys of the Christian Heaven are celebrated in Hymns which are frequently very beautiful, even if they do not mount to the sublimity of the ancient Hebrew ode. One of the finest of these is the free translation by Pope of the Latin (not originally Christian) ode standing at the commencement of this volume. It runs thus:—

'Vital spark of heavenly flame!
Quit, oh, quit this mortal frame!
Trembling, hoping, ling'ring, flying!
Oh, the pain, the bliss of dying!

Cease, fond Nature, cease thy strife,
And let me languish into life!

Hark! they whisper—angels say,
"Sister spirit, come away!"
What is this absorbs me quite;
Steals my senses, shuts my sight;
Drowns my spirits, draws my breath?
Tell me, my soul, can this be—death?

The world recedes! it disappears!
Heaven opens to my eyes!—my ears
With sounds seraphic ring:
Lend, lend your wings! I mount! I fly!
O Grave! where is thy victory?
O Death! where is thy sting?'

Many specimens might be given if our object were to collect together the Christian Hymns relating to Heaven. Sometimes, too, we have beautiful descriptions not in verse, and Bunyan's account of the reception of Christian and Hopeful at the Celestial City will at once occur to the reader as not inferior in the claims of true poetry to anything that we have in verse.

255. Now, if we analyse such hymns of joy, we find in them two prominent chords, one or other of which is always struck. The first expresses the Christian's sense of relief from sorrow and death, and the second his joy in the anticipated presence of Christ—his intense desire to behold the King in his beauty.

These chords are struck together by St. John, when he says (Rev. xxi. 3, 4), 'And I heard a great voice out of heaven saying, Behold, the tabernacle of God is with men, and he will dwell with them, and they shall be his people, and God himself shall be with them, and be their God. And God shall wipe away

all tears from their eyes; and there shall be no more death, neither sorrow, nor crying, neither shall there be any more pain: for the former things are passed away.' In other respects the descriptions of the Christian heaven are no doubt figurative. They are intended for Christians of all ages of the world, and have hardly any reference to the material conditions of life in a future state. These could not be apprehended by believers 1800 years ago, inasmuch as we can hardly be said to grasp them now. Nevertheless there is one direction in which *we do think* we are able to obtain a glimpse into the conditions of this future life.

256. One of the most prominent characteristics of even the well-directed human mind is its insatiable curiosity. How intensely anxious we all are to realise the conditions of the life of our forefathers in the ruder and earlier times; how interested in every scrap of intelligence which reaches us from the dead old world! How interested too in any light thrown upon the civilisation which preceded these old times! What would not any man give for half an hour with Socrates or Plato? what would he not give, be he Christian or unbeliever, to have pictured out vividly and truly before him some episode in the life of Christ? In a tedious, toilsome, tantalising, roundabout way we do indeed get some passing glimpses into these ancient historical ages.

The earth is not unlike the human brain, in that it contains in itself certain memories of the past: and, just as we rummage out and hunt up in our brains old memories, so do the historian and the antiquary search about in the earth for that memory which it

retains of those distant but glorious ages. But the universe, no less than the individual, has another memory besides the material one, and we have endeavoured (Art. 196) to convince our readers that nothing is really lost, the past being always present in the universe. If this be the case, it may readily be conceived that this universal memory may by some process of exaltation and intensification, or as it were by some relay battery of the universe, be occasionally quickened into such a life that the individual in the future and glorified state may be enabled (through the power of the Lord) to realise scenes that happened in the far distant past. For if so much can be accomplished with a thing so little plastic as the material memory of the earth, what may not be done with that infinitely more plastic form of existence which we term the world to come?

257. Again, if in this present world we have great difficulty in realising our own past, we have even greater difficulty in realising what is at this very moment taking place in remote parts of the present visible universe. Astronomers and Physicists agree that life is possible in the planet Mars, and it is quite likely that intelligent beings analogous to ourselves exist at the present moment on the surface of that planet, but we shall never in this life know for certain anything about them. There is an insurmountable barrier to physical inquiry as great as if Mars belonged to the unseen universe, instead of being, what he is in reality, our next-door neighbour in the present.

Now, may not this barrier be removed in the future state? This has been a favourite topic with scientific theologians, and we believe that all who have

speculated on the conditions of a future life have unanimously agreed that we shall have much greater freedom of motion in the world to come. There can be no doubt that our relations to time and space will then be greatly altered and enlarged. Men shall run to and fro in the universe, and knowledge shall be increased.

258. But yet the picture is not altogether one of intellectual brightness and beauty. It wears also a moral aspect, and upon this almost exclusively the Christian records dwell. We are told in these records that nothing is forgotten. Christ tells us (St. Luke viii. 17), 'Nothing is secret, that shall not be made manifest; neither anything hid, that shall not be known and come abroad.' And again St. John tells us (Rev. xx. 12), 'I saw the dead, small and great, stand before God: and the books were opened; and another book was opened, which is the book of life: and the dead were judged out of those things which were written in the books, according to their works.' This thought has been developed by the Rev. Alexander Macleod, D.D., in a work entitled *Our own Lives the Books of Judgment.* This author points out that in many cases it may not be even necessary to appeal to the universe for the record which is therein written, for this is sufficiently stamped upon the body itself, and he then draws a vivid and lurid picture of the sensual man in whom the mortal body is like a parchment written within and without—a truly mournful and terrible record of the deeds done in the body.

But if all this is possible with an organism possessing so little plasticity as the natural body, and where the wish of the individual is to preserve a respectable

exterior, what must be the case in the spiritual body[1] of such a man?—'If they do these things in a green tree, what shall be done in the dry?' What a hideous and horrible likeness must not that foul thing have that issues forth from the 'grave and gate of Death' into the presence of the Unseen and Eternal?

259. It is extremely striking to read in this connection the following extract from Plato's *Gorgias*. We quote from Jowett's translation. Socrates is the speaker:—

"This is a tale, Callicles, which I have heard and believe, and from which I draw the following inferences: Death, if I am right, is in the first place the separation from one another of two things, soul and body;—this, and nothing else. And after they are separated they retain their several characteristics, which are much the same as in life; the body has the same nature and ways and affections, all clearly discernible; for example, he who by nature or training, or both, was a tall man while he was alive, will remain as he was after he is dead; and the fat man will remain fat; and so on: and the dead man, who in life had a fancy to have flowing hair, will have flowing hair. And if he was marked with the whip and had the prints of the scourge, or of wounds in him while he was alive, you might see the same in the dead body; and if his limbs were broken or misshapen while he was alive, the same appearance would be visible in the dead. And, in a word, whatever was the habit of the body during life would be distinguishable after death, either perfectly or in a great measure and for a time. And I should infer that this is equally true of the soul, Callicles;

[1] [Those who believe that the New Testament asserts the annihilation of the wicked in *Gehenna*, of course hold that only the just obtain the spiritual body. But we have no definite term for the body as it shall be (in the *Hades* of the New Testament) between death and the resurrection. It is probable that the want of such a term is due to the fact that the authors of our recognised version have unfortunately rendered both Hades and Gehenna indifferently by the word Hell, itself a term from Scandinavian mythology.]

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when the man is stripped of the body all the natural or acquired affections of the soul are laid open to view. And when they come to the judge, as those from Asia came to Rhadamanthus, he places them near him and inspects them quite impartially, not knowing whose the soul is: perhaps he may lay hands on the soul of the great king, or of some other king or potentate, who has no soundness in him, but his soul is marked with the whip, and is full of the prints and scars of perjuries, and of wrongs which have been plastered into him by each action, and he is all crooked with falsehood and imposture, because he has lived without truth. Him Rhadamanthus beholds, full of all deformity and disproportion, which is caused by licence and luxury and insolence and incontinence, and despatches him ignominiously to his prison, and there he undergoes the punishment which he deserves.'

260. As, in Eastern monarchies, a veil was sometimes cast over the face of the guilty;[1] so in the New Testament the veil of darkness is drawn over the fate of the lost soul who falls into the hands of the living God. 'And when the king came in to see the guests, he saw there a man which had not on a wedding-garment: and he saith unto him, Friend, how camest thou in hither, not having a wedding-garment? And he was speechless. Then said the king to the servants, Bind him hand and foot, and take him away, and cast him into outer darkness; there shall be weeping and gnashing of teeth."[2]

[1] 'As the word went out of the king's mouth, they covered Haman's face.'—Esther vii. 8.

[2] St. Matthew xxii. 11-13. [See, however, also Luke xiii. 28, where the true meaning obviously is '*while ye are being cast out.*' There are other obvious mistranslations in our version; such as for instance that of Mark ix. 43, where for 'the fire that cannot be put out' we have 'the fire that never shall be quenched.' It is to be hoped that the revised version will be such as to give readers ignorant of Greek a thoroughly correct idea of the meaning of the original, most especially on points of such awful importance as this.]

We greatly question whether any school of theologians have succeeded in throwing a single ray of real light into this mysterious region.[1] Our readers are well aware that there are three such schools. One of these contemplates the eternity of punishment physical, mental, or both; another the final salvation of all men; while a third expects the annihilation of the wicked in Gehenna. Now while it is entirely without our province to enter into these discussions, we may yet be permitted to point out that, as it appears to us, the principle of Continuity demands not merely one state, but rather an eternal and infinite succession of states, in order to constitute true immortality.

The precise conditions of such an immortality it is not for us to discuss. Under any school of theological thought a glorious immortality implies the ultimate union, morally and spiritually, of the individual with the Divine over-life, while the fate of the impenitent must surely be something so awful that language fails to bring it fully before the mind.

261. But this graphic and powerful picture of the fate of the lost fared as badly as other New Testament conceptions when it fell into the hands of the materialists of the middle ages. Its meaning was entirely altered, and the Christian Hell, instead of being the Gehenna of the Universe, where all its garbage and filth is consumed, was changed into a region shut in by adamantine walls and full of impossible physical fires—the Devil being the chief stoker.

The one idea is awful, while the other is simply

[1] The extent of our knowledge, or rather of our ignorance, on this subject has been happily rendered by the Rev. Dr. Irons, when he states that all we are authorised to infer is that retribution will be morally complete.

grotesque. An ancient Jew who had occasion to pass by the valley of Hinnom, and whose senses were invaded by the sights and smells of that doleful region, must have entertained a conception of the Hell described by Christ as different as possible from that which has reached us from the middle ages, and to which some even of the readers of this book may have been accustomed in their earlier years. The reader who desires to know something of the more than fiendish malignity with which human beings (mainly Christian ministers) have *improved upon* the solemn but markedly reserved language of Scripture on such points has only to refer to the *Inferno*. Perhaps the hideous realism of Doré's illustrations will of itself be enough for him. If not, a very few lines of the original cannot fail to suffice.

Perch' io dissi :—Maestro, esti tormenti
Cresceranno ei dopo la gran sentenza,
O fien minori, o saran si cocenti ?
Ed egli a me :—Ritorna a tua scienza,
Che vuol, quanto la cosa è più perfetta,
Più senta 'l bene, e così la doglienza.
Tutto che questa gente maledetta
In vera perfezion giammai non vada,
Di là, più che di qua, essere aspetta.[1]

Since the time of Dante many attempts have been made, unsuccessfully, by men without his genius, to import additional horror.

[1] The sense is as follows :—Master, said I, will these torments increase after the great judgment, will they be less, or equally severe ? He replied—Go back to your scholastic learning, which tells you that the more perfect the being the more he feels both pleasure and pain. And, although these accursed ones can never reach full perfection, they expect to be more perfect after than before (the judgment).

To some extent no doubt Christ's description of the Universal Gehenna must be regarded as figurative, but yet we do not think that the sayings of Christ with regard to the unseen world ought to be looked upon as nothing more than pure figures of speech. We feel assured that the principle of Continuity cries out against such an interpretation—may they not rather be descriptions of what takes place in the unseen universe brought home to our minds by means of perfectly true comparisons with the processes and things of this present universe which they most resemble? And just as, in the visible universe, there is apparently an enormous and inexplicable *waste* of germs, seeds, and eggs of all kinds, which die simply because they are useless—analogy would lead us to conclude that something similar, and to at least as enormous an extent, happens in the Unseen with the germs of spiritual frames. The caterpillar which has not chosen a secure place of refuge in which to assume the chrysalis form does not live to become a perfect insect. The seeds that fell by the wayside, though scattered by an intelligent sower, were devoured by the birds of the air. 'Let every one of them pass away, like the untimely birth of a woman, that they may not see the sun.' 'For many are called, but few chosen.'[1]

262. Thus the Christian Gehenna bears to the

[1] [We ought perhaps to inform our readers that what we have here said refers to that particular state after the present—the dying out of which, in consequence of voluntary separation from its centre of life and energy, has been called the second death. Whether this dying out is equivalent to absolute annihilation is a point which we do not pretend to discuss.]

Unseen Universe precisely the same relation as the Gehenna of the Jews did to the city of Jerusalem; and just as the fire was always kept up and the worm ever active in the one, so are we forced to contemplate an enduring process in the other.

For we cannot easily agree with those who would limit the existence of evil to the present world. We know now that the matter of the whole of the visible universe is of a piece with that which we recognise here, and the beings of other worlds must be subject to accidental occurrences from their relation with the outer universe in the same way as we are. But if there be accident, must there not be pain and death? Now these are naturally associated in our minds with the presence of moral evil.

We are thus drawn, if not absolutely forced, to surmise that the dark thread known as evil is one which is very deeply woven into that garment of God which is called the Universe.

In fine, just as the arguments of this chapter lead us to regard the whole Universe[1] as eternal, so in like manner are we led to regard evil as eternal, and therefore we cannot easily imagine the Universe without its Gehenna, where the worm dieth not, and the fire is not quenched. The *process* at all events would seem to be most probably an enduring one. [Many passages of the New Testament, however, seem to point to a continuity of moral development in the unseen universe, a development whose climax is to be

[1] Including in it *a state of things* like the present physical universe; not, however, *the very things* that now exist, these being evanescent in energy at least, if not also in material.

reached when the last enemy, death, is destroyed in Gehenna.]

263. But it is fruitless to expect that Science should throw any light upon that greatest of all mysteries—the origin of evil. We have now come to a region where we must suffer ourselves to be led solely by the light which is given us in the Christian Records. And while here we would quote from a very remarkable work on the Lord's Prayer[1] by the Rev. Charles Parsons Reichel, B.D., which exhibits in a singularly clear light the testimony given by Scripture, as well as the fruitlessness of all attempts to obtain information from any other quarter. Our first extract relates to the personality of 'The Evil One:'—

'In refutation' (says the writer) 'of the objections that have been urged against the personal existence of the Adversary, this one observation is quite enough: that of the world of spirits we cannot possibly know anything save by direct revelation. It is beyond the domain of the senses; it is beyond the cognisance of reason. A man born blind might therefore as rationally attempt to disprove by a process of reasoning the existence of a sense of which he can know nothing except by testimony, as we attempt by a process of reasoning to disprove the existence of a spirit of whose existence we can know nothing save by testimony. The only point to be ascertained in either case is whether the testimony be sufficient. If the testimony of Scripture be deemed sufficient, then I cannot see that it is possible to deny the Personal existence of Satan any more than that of God. *How* Satan exists, or *where* at the present time, or how his power *avails*, as we are told it does, to contrive and suggest temptations to the mind of man; and to what extent he is aware of what is passing in men's minds, so as to adapt his suggestions to their weakness, we are not told, and do not therefore know.

[1] *Cambridge*, Macmillan, 1855.

But our not being told the manner in which his power is exercised and brought to bear, is no proof of the unreality of that fearful Being who is everywhere in the New Testament exhibited as the adversary of God and goodness, whether in the individual, or in the development of the human race.'

The next passage is one which all of us may study with much advantage. It refers to temptation :—

'Every risk incurred unnecessarily for the sake of exhibiting our trust in God, every unusual or unnecessary act done merely or chiefly for the purpose of displaying our privileges or our conviction, or of attracting attention and admiration, every stepping out of the plain, unadorned, and *unadmired* path of simple duty, is a phase of it.'

. . . . . .

'Why God should permit any of his creatures to be tempted is a question we can no more answer than we can that question of which indeed it is but a case, why God should permit evil to exist at all. But we know that evil does exist; and we know too that temptation does exist. That evil was first introduced into the world by a Being who goes under the name of Satan or the Adversary (2 Cor. xi. 3) we are told: that this Being endeavoured first to seduce, and afterwards to menace our Saviour into evil; and that he is constantly engaged in tempting us as he tempted Christ, we are also told.'

. . . . . .

'And the true rendering of the last clause in Christ's own prayer would seem to intimate that the same Being is also busy in suggesting temptations to every follower of Christ—"Lead us not into temptation, but deliver us from the Evil One."'

264. But we must now draw to a close; first of all, however, let us briefly sum up the results of our discussion.

The great scientific principle which we have made use of has been the Law of Continuity. This simply

means that the whole universe is of a piece; that it is something which an intelligent being is capable of understanding, not completely nor all at once, but better and better the more he studies it.

In this great whole which we call the Universe there is no impenetrable barrier to the intellectual development of the individual. Death is not such a barrier, whether we contemplate it in others, or whether we experience it ourselves. And the same continuity which has been insisted on with reference to our intellectual conceptions of the universe applies, we have little doubt, to the other faculties of man, and to other regions of thought.

When we regard the universe from this point of view we are led to a scientific conception of it which is, we have seen, strikingly analogous to the system which is presented to us in the Christian religion. For not only are the nebulous beginning and fiery termination of the present visible universe indicated in the Christian records, but a constitution and power are therein assigned to the Unseen Universe strikingly analogous to those at which we arrive by a legitimate scientific process.

265. Our readers are now in a position to perceive the result of questioning science in this manner, and of abandoning ourselves without mistrust or hesitation to the guidance of legitimate principles. It is that science so developed, instead of appearing antagonistic to the claims of Christianity, is in reality its most efficient supporter; and that the burden of showing how the early Christians got hold of a c· stitution of the unseen universe, altogether di

from any other cosmogony, but similar to that which modern science proclaims, is transferred to the shoulders of the opponents of Christianity.

266. For the present we would only add that the principle, of the aid of which we have availed ourselves, is not a mere theological weapon, but will, we believe, ultimately prove a most powerful scientific auxiliary. Already we have used it in our endeavour to modify the most probable hypothesis which has been formed concerning the ultimate constitution of matter.

The truth is, that science and religion neither are nor can be two fields of knowledge with no possible communication between them. Such a hypothesis is simply absurd.

There is undoubtedly an avenue leading from the one to the other, but this avenue is through the unseen universe, and unfortunately it has been walled up and ticketed with '*No road this way*,' professedly alike in the name of science at the one end, and in the name of religion at the other.

We are in hopes that when this region of thought comes to be further examined it may lead to some common ground on which followers of science on the one hand, and of revealed religion on the other, may meet together and recognise each other's claims without any sacrifice of the spirit of independence, or any diminution of self-respect. Entertaining these views we shall welcome with sincere pleasure any remarks or criticism on these speculations of ours, whether by the leaders of scientific thought or by those of religious inquiry.

It must never be forgotten that, whether we take the scientific or the religious point of view, one great object of our life in the visible universe is obviously to *learn;* and that (as human beings are constituted) advance in learning necessarily implies a high purpose kept steadily before us, and a continuous and arduous pursuit. For, as we are told in the First Epistle of John, 'This is the victory which overcometh the world, even our faith.'

Τῷ νικῶντι δώσω αὐτῷ φαγεῖν ἐκ τοῦ
ξύλου τῆς ζωῆς . . .

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